# Economic Benefits of Energy Efficiency Programs

## A Case Study of Investments by the Los Angeles Department of Water & Power

UCLA Luskin School of Public Affairs

Luskin Center FOR INNOVATION

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## ACKNOWLEDGMENTS

The UCLA Luskin Center for Innovation would like to thank the Los Angeles Department of Water and Power (LADWP) for supporting this study, as well as its 2014 predecessor, *Efficiently Energizing Job Creation in Los Angeles*. In particular, we are grateful for the continued leadership of David Jacot, Director of Efficiency Solutions. The authors would also like to recognize the LADWP management staff who provided information and data throughout the data collection period. The outputs of such a project are only as strong as the inputs received and we are grateful for the dedicated support. We specifically would like to thank Gretchen Hardison, Environmental Affairs Officer, for her leadership in collecting much of the information needed to complete this study.

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The UCLA Luskin Center for Innovation appreciates the contributions of the aforementioned individuals. This paper, however, does not necessarily reflect their views nor an endorsement of its findings. Any errors are those of the authors.

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# 1. Executive Summary

This study estimates the economic benefits of energy efficiency programs administered by the Los Angeles Department of Water and Power (LADWP). The report focuses on the 22 programs that LADWP administered in fiscal year (FY) 2016-17, the most recent year for which complete implementation details were available at the time of writing this report.

To quantify the economic benefits of LADWP's energy efficiency programs, we focus on three key metrics—number of jobs, value added, and labor income—to quantify the benefits of energy efficiency programs for local workers, businesses, and public agencies in Los Angeles County.[1] Value added is a local proxy for gross domestic product (GDP) and isolates the wealth generated by an investment that ends up in three forms: income for workers, profits for businesses, and taxes for local government. Labor income is a subset of value added that represents the total dollar value of employee compensation (wages and benefits) and proprietor income (payments received by self-employed individuals and unincorporated business owners).

LADWP's suite of energy efficiency programs perform particularly well according to these three metrics because they generate energy cost savings for LADWP customers, leverage co-investment from residents and businesses, and rely heavily on local labor for program activities. In particular, we find that LADWP's investment in energy efficiency, on average, supports more local jobs per dollar of investment than the oil and gas sector, a common benchmark for comparing investments in energy resources. This finding also holds true when value added and labor income are the units of comparison.

## 1.1 A Diverse Suite of Programs

The programs covered in this study serve a diversity of customers, including residential, commercial, industrial, and institutional. For residential customers, several programs specifically serve low-income Angelenos, such as the Refrigerator Exchange Program and the Energy Savings Assistance Program that provide free energy efficient refrigerators and weather stripping services, respectively, to low-income households. The programs covered in this study also represent a broad range of program types, including financial incentive programs that provide rebates to customers who upgrade to more energy efficient appliances, direct installation programs that perform building upgrades at no cost to the costumer, and new construction programs that provide design assistance to developers in adopting efficiency measures that go above and beyond California's Building Energy Efficiency Standards (Title 24) requirements, among many others.

LADWP groups its energy efficiency programs into three broad categories. Mass market programs generally serve residential customers and encourage them to upgrade to energy efficient appliances, with a few exceptions. Commercial, industrial, and institutional (CII) programs generally serve large nonresidential customers and range in scope from simple lighting upgrades to entire building overhauls. Lastly, crosscutting programs serve a wide variety of customer types and employ broad strategies for achieving energy savings (e.g., planting street trees, informing updates to building codes, customer outreach, etc.). **Table ES.1** provides an overview of how the programs analyzed here fit into these three groups.

[1] Job quality is another important aspect of evaluating the economic benefits of an investment, but was outside the scope this study. Important metrics for analyzing job quality could include wages, health benefits, retirement benefits, career ladder opportunities, and job training, among others.

**Table ES.1. LADWP Energy Efficiency Programs Studied in This Report**

| Program | Energy Efficiency Measures |
|---|---|
| **Residential Mass Market Program** | |
| Efficient Product Marketplace | Lighting, Refrigerator, Air Conditioning, Thermostat, Power Strips |
| Consumer Rebate Program | Windows, Heating/Air Conditioning, Pool Pump, Cool Roof, Fans |
| Home Energy Improvement Program | Building Envelope, Heating/Air Conditioning, Lighting |
| Refrigerator Exchange Program | Refrigerator |
| Refrigerator Turn-In & Recycle | Refrigerator |
| AC Optimization Program | Air Conditioning |
| Residential Lighting Efficiency Program | Lighting |
| Energy Savings Assistance Program | Lighting, Building Envelope |
| Home Upgrade Energy Upgrade California | Building Envelope, Heating/Air Conditioning, Roof, Pool Pump |
| **Commercial, Industrial, and Institutional Programs** | |
| Commercial Lighting Incentive Program | Lighting |
| Custom Performance Program | Lighting, Heating/Air Conditioning, Windows, Equipment Controls |
| Savings by Design | Building Envelope, Lighting, Heating/Air Conditioning |
| Upstream HVAC | Heating/Air Conditioning |
| California Advanced Home Program | Home Appliances, Design and Construction |
| LAUSD Direct Install | Lighting, Heating/Air Conditioning |
| Commercial Direct Install | Lighting |
| Food Service Program | Commercial Food Appliances |
| **Crosscutting Programs** | |
| City Plants | Shade Trees for Homes and Buildings |
| Codes, Standards & Ordinances | Building, Appliance, and Construction Codes |
| LADWP Facilities Upgrade | Lighting |
| Program Outreach & Community Partnerships | Promotion of LADWP Incentive Programs by Nonprofits |
| Emerging Technologies | Research on Emerging Energy Savings Technologies |

## 1.2 The Ripple Effects of Investment in Energy Efficiency

Investments in energy efficiency have multiple ripple effects across the economy. First, they generate cost savings for customers. Energy efficient LED retrofits, for example, can achieve 50 percent energy savings that can pay back customers for their installation costs (after incentives) in a couple of years or less. On average, every one-time investment of a dollar by LADWP in energy efficiency translates to $0.53 in energy cost savings for customers per year (for the lifetime of the measure). Much of these energy cost savings then get reinvested back in the local economy.

Second, energy efficiency projects often leverage co-investment from local businesses and households. Financial incentive programs such as the Consumer Rebate Program, the Efficient Product Marketplace, and Custom Performance Program require participants to provide matching funds for their energy efficient purchase or upgrade. This co-investment increases the amount of total investment associated with the program, and ultimately the employment and economic benefits reported for that program. In total, $53 million in co-investment was estimated for FY 2016-17, which translates to an additional $0.43 invested in energy efficiency for every LADWP dollar invested.

Third, each of the three investment streams studied here—investment from LADWP, co-investment from businesses and households, and energy cost savings—have direct, indirect, and induced impacts on the local economy. Direct impacts are the changes in employment and economic activity that occur upon the initial implementation of a program (e.g., an increase in demand for electricians, engineers, and technicians). Indirect impacts are those that occur along the supply chains that provide inputs or services to directly impacted industries (e.g., an increase in demand for truck drivers to deliver goods and retailers to sell them). Induced impacts are those that occur when households, workers, or proprietors receive and spend their income as a result of the direct and indirect impacts previously described (e.g., electricians and truck drivers spending their income on groceries, medical care, childcare, etc.). Induced impacts also occur as the result of energy cost savings for LADWP customers, which function like an increase in income for households and businesses.

In this study we summed the direct, indirect, and induced impacts of direct LADWDP investment, co-investment, and energy cost savings in order to arrive at a total job number for each program (see **Figure ES.1**). The same approach was employed for estimating the value added and labor income associated with each programmatic investment. **Table ES.2** summarizes the investment levels for each program, and **Chapter 2 – Methodology** describes how these investment levels were ultimately translated to employment and economic benefits.

**Figure ES.1. Summary of Study Scope**

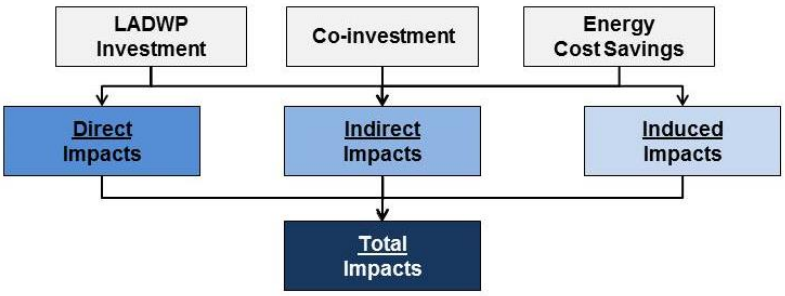


**Table ES.2. Investment Levels of LADWP Energy Efficiency Programs in FY 2016-17**

| Program | FY 2016-17 Expenditures | Co-investment[2] | Energy Cost Savings |
|---|---|---|---|
| **Residential Mass Market Programs** | | | |
| Efficient Product Marketplace | $1,217,110 | $7,696,648 | $78,282 |
| Consumer Rebate Program | $8,198,835 | $35,469,456 | $1,654,538 |
| Home Energy Improvement | $8,999,943 | N/A | $736,334 |
| Refrigerator Exchange Program | $3,466,222 | N/A | $395,376 |
| Refrigerator Turn-In & Recycle | $429,021 | N/A | $1,342,713 |
| AC Optimization Program | $2,856,824 | N/A | $1,025,357 |
| Residential Lighting Efficiency Program | $18,725,769 | N/A | $7,644,367 |
| Energy Savings Assistance Program | $577,000 | N/A | $204,543 |
| Home Upgrade Energy Upgrade California | $956,938 | $6,623,318 | $123,611 |
| **Commercial, Industrial, and Institutional Programs** | | | |
| Commercial Lighting Incentive Program | $8,159,637 | $1,013,895 | $4,855,496 |
| Custom Performance Program | $8,334,517 | $1,851,321 | $4,969,891 |
| Savings by Design | $3,845,587 | N/A | $1,038,018 |
| Upstream HVAC | $3,064,203 | N/A | $1,576,929 |
| California Advanced Home Program | $2,710,211 | N/A | $341,546 |
| LAUSD Direct Install | $721,641 | N/A | $82,227 |
| Commercial Direct Install | $42,643,954 | N/A | $10,838,617 |
| Food Service Program | $265,427 | $32,981 | $53,977 |
| **Crosscutting Programs** | | | |
| City Plants | $2,280,000 | $315,000 | $1,528,101 |
| Codes, Standards & Ordinances | $624,106 | N/A | $27,126,832 |
| LADWP Facilities Upgrade | $2,652,853 | N/A | $168,955 |
| Program Outreach & Community Partnerships | $1,696,000 | N/A | N/A[3] |
| Emerging Technologies | $620,546 | N/A | N/A[4] |
| **TOTAL** | **$123,046,342** | **$53,002,619** | **$65,785,259** |

[2] See individual program chapters for rationale on why co-investment was modeled for some programs and not for others.
[3] As a non-resource program, the energy savings accrued by this program are indirect and measured through the other LADWP resource programs analyzed in this report.
[4] See footnote above.

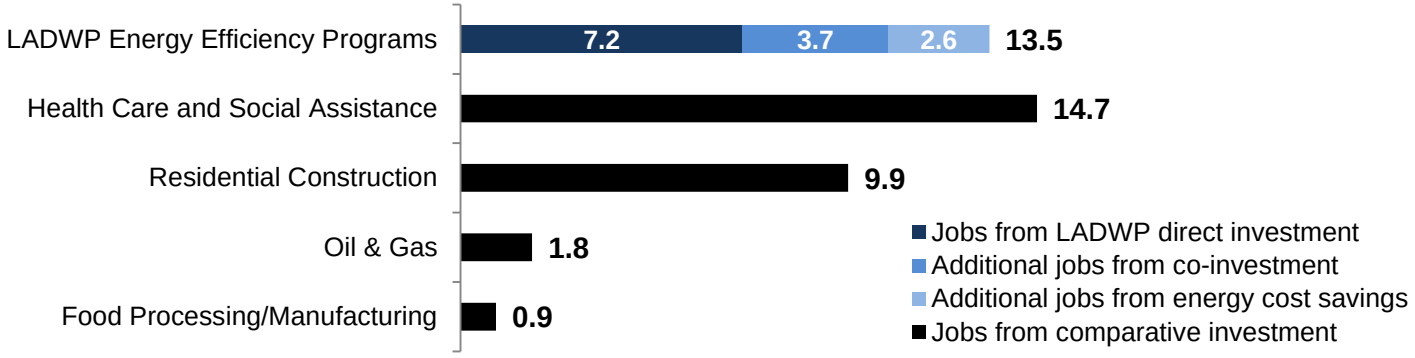
## 1.3 Regional Employment Benefits

The employment benefits from LADWP's suite of energy efficiency programs vary greatly from program to program. These programs, after all, are heterogeneous by design. In general, the programs that support the most jobs, given the same level of funding, had one or more of the following characteristics: (1) greater spending on labor than materials; (2) local sourcing of goods and services; (3) co-investment from consumers and businesses; and (4) significant energy cost savings for customers.[5] The influence of each of these four factors on a program's ultimate employment benefits is described in **Chapter 2 – Methodology.**

**Table ES.3** summarizes the employment benefits of each program based on FY 2016-17 expenditures. Results are standardized per million dollars of LADWP investment (referred to as the program's employment multiplier), and are also totaled according to FY 2016-17 funding levels. All job numbers are reported in full-time equivalent (FTE) job-years, which is the equivalent of one person working full-time for one year. In practice, one job-year may take the form of two employees for six months each, three employees for four months each, or any other combination of employees that adds up to one year's worth of full-time work.

To assess the relative employment benefits of energy efficiency programs, it is instructive to compare them to other industries. In this study, we focus on four benchmark industries: (1) the oil and gas sector, the conventional alternative to energy efficiency for meeting peak demand; (2) health care and social assistance, the largest industry in Los Angeles County by employment; (3) food processing/manufacturing, the largest manufacturing industry in Los Angeles County by employment; and (4) residential construction, which is often viewed as a regional job engine.[6] **Figure ES.2** visualizes the range of employment multipliers across these benchmark industries compared to LADWP's energy efficiency programs. When the additional jobs supported by energy cost savings and co-investment are included in the picture, LADWP energy efficiency programs support more jobs per million dollars of direct investment than all benchmark industries, except for the health care sector, which is particularly labor intensive.

**Figure ES.2. Jobs from Energy Efficiency Programs vs. Benchmark Industries[7]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[5] Wages and benefits also affect an investment's employment multiplier, but analyzing the compensation packages for workers at every stage of the supply chain was outside the scope of this study.
[6] Employment sizes were obtained from the U.S. Census Bureau, 2016 County Business Patterns.
[7] The employment multiplier for LADWP energy efficiency programs is a weighted average of the 22 programs listed in **Table ES.2** according to FY 2016-17 funding levels. Employment multipliers for the four comparison industries do not include jobs supported by co-investment or energy cost savings. These additional jobs, however, were included in the employment multiplier for LADWP Energy Efficiency Programs, which is intentionally designed to generate co-investment and reduce energy costs. See **Appendix 1** for the mix of industrial sectors that are included in each benchmark industry.

**Table ES.3. Jobs Supported by LADWP Energy Efficiency Programs in FY 2016-17**

| Program | FY 2016-17 Expenditures | Employment Multiplier[8,9] | Total FTE Job-Years[10] |
|---|---|---|---|
| **Residential Mass Market Programs** | | | |
| Efficient Product Marketplace | $1,217,110 | 41.5 | 50.5 |
| Consumer Rebate Program | $8,198,835 | 55.8 | 457.5 |
| Home Energy Improvement | $8,999,943 | 8.8 | 79.5 |
| Refrigerator Exchange Program | $3,466,222 | 2.3 | 8.0 |
| Refrigerator Turn-In & Recycle | $429,021 | 26.4 | 11.3 |
| AC Optimization Program | $2,856,824 | 7.7 | 22.0 |
| Residential Lighting Efficiency Program | $18,725,769 | 2.4 | 45.0 |
| Energy Savings Assistance Program | $577,000 | 9.9 | 5.7 |
| Home Upgrade Energy Upgrade California | $956,938 | 59.2 | 56.7 |
| **Commercial, Industrial, and Institutional Programs** | | | |
| Commercial Lighting Incentive Program | $8,159,637 | 10.0 | 82.0 |
| Custom Performance Program | $8,334,517 | 10.8 | 90.3 |
| Savings by Design | $3,845,587 | 9.6 | 36.8 |
| Upstream HVAC | $3,064,203 | 6.0 | 18.3 |
| California Advanced Home Program | $2,710,211 | 10.3 | 28.0 |
| LAUSD Direct Install | $721,641 | 9.6 | 6.9 |
| Commercial Direct Install | $42,643,954 | 10.7 | 454.8 |
| Food Service Program | $265,427 | 8.5 | 2.3 |
| **Crosscutting Programs** | | | |
| City Plants | $2,280,000 | 13.0 | 29.6 |
| Codes, Standards & Ordinances | $624,106 | 225.1 | 140.5 |
| LADWP Facilities Upgrade | $2,652,853 | 6.4 | 16.9 |
| Program Outreach & Community Partnerships | $1,696,000 | 7.5 | 12.7 |
| Emerging Technologies | $620,546 | 5.0 | 3.1 |
| **TOTAL** | **$123,046,342** | **13.5** | **1,658** |

[8] In this study, an employment multiplier represents the number of FTE job-years in Los Angeles County per million dollars of direct LADWP investment.
[9] The job numbers reported here represent the direct, indirect, and induced jobs supported by all three investment streams: LADWP direct investment, co-investment, and energy cost-savings.
[10] See footnote above.

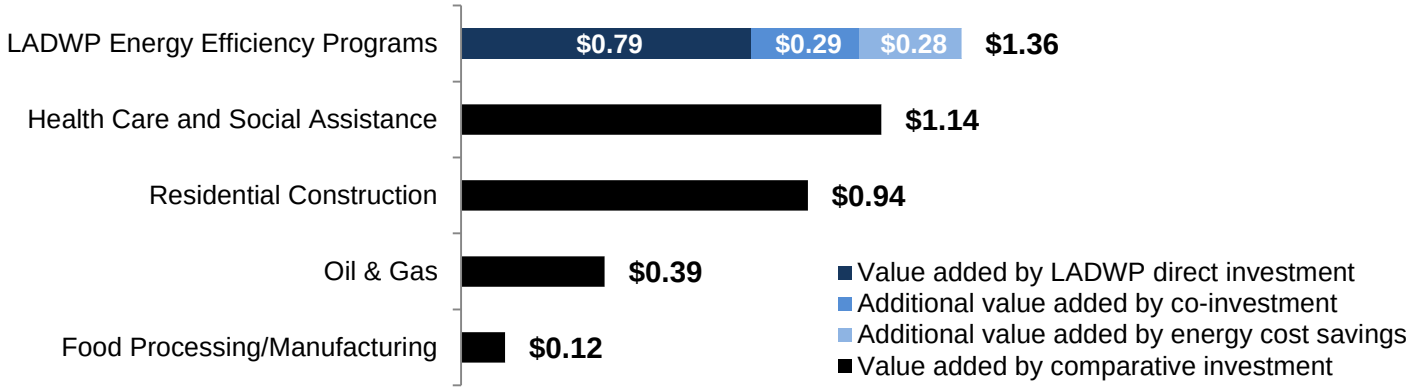
## 1.4 Regional Economic Benefits: Value Added

Along with employment, investments in energy efficiency also generate other economic benefits that can be quantified for comparative purposes. In this study, we analyze the value added by LADWP's suite of energy efficiency programs to the Los Angeles County economy. Value added is essentially a measure of a gross domestic product (GDP), and represents the difference between the final price of goods and services produced by an investment and the cost of intermediate inputs consumed during production. Thus, a business that takes existing products and resells them (e.g., a wholesaler), creates less added value for the economy than a business that harnesses their access to land, labor, and capital to create something entirely new (e.g., a construction firm). In effect, value added is a measure of the additional wealth created by an investment that ends up in the form of labor income, profits, and taxes.

**Table ES.4** summarizes the value added by each program we analyzed, based on FY 2016-17 expenditures. Results are standardized per million dollars of LADWP investment (referred to as the program's value added multiplier), and are also totaled according to FY 2016-17 funding levels. The same factors that influence a program's employment multiplier also influence the program's value added multiplier. Thus, the programs with the greatest value added multipliers were those that leveraged co-investment, achieved significant energy cost savings, and relied more heavily on labor than materials, in particular local labor.

**Figure ES.3** visualizes how the average value added multiplier for LADWP's energy efficiency programs compares to the four benchmark industries. LADWP's energy efficiency programs add more value to the local economy (per dollar of direct investment) than all four benchmark industries, including the value added by co-investment and energy cost savings. The value added is less than one dollar for many of the direct investment scenarios (excluding health care services) because not every dollar spent stays within Los Angeles County, as some goods and services cannot be locally sourced.

**Figure ES.3. Value Added by Energy Efficiency Programs vs. Benchmark Industries[11]**
**(Value Added to Los Angeles County per Dollar of Direct Investment)**




[11] The value added multiplier for LADWP energy efficiency programs is a weighted average of the 22 programs in **Table ES.2** according to FY 2016-17 funding levels. Value added multipliers for the four comparison industries do not include the value added by co-investment or energy cost-savings. This additional value, however, was included in the multiplier for LADWP energy efficiency programs, which is intentionally designed to generate co-investment and reduce energy costs. See **Appendix 1** for the mix of industrial sectors that are included in each benchmark industry.

**Table ES.4. Value Added by LADWP Energy Efficiency Programs in FY 2016-17**

| Program | FY 2016-17 Expenditures | Value Added Multiplier[12,13] | Total Value Added[14] |
|---|---|---|---|
| **Residential Mass Market Programs** | | | |
| Efficient Product Marketplace | $1,217,110 | $4.35 | $5,297,844 |
| Consumer Rebate Program | $8,198,835 | $4.11 | $33,671,492 |
| Home Energy Improvement | $8,999,943 | $1.32 | $11,924,780 |
| Refrigerator Exchange Program | $3,466,222 | $0.30 | $1,048,315 |
| Refrigerator Turn-In & Recycle | $429,021 | $2.97 | $1,275,033 |
| AC Optimization Program | $2,856,824 | $0.94 | $2,687,723 |
| Residential Lighting Efficiency Program | $18,725,769 | $0.29 | $5,401,850 |
| Energy Savings Assistance Program | $577,000 | $1.19 | $686,321 |
| Home Upgrade Energy Upgrade California | $956,938 | $5.33 | $5,102,049 |
| **Commercial, Industrial, and Institutional Programs** | | | |
| Commercial Lighting Incentive Program | $8,159,637 | $1.30 | $10,570,678 |
| Custom Performance Program | $8,334,517 | $1.29 | $10,728,392 |
| Savings by Design | $3,845,587 | $1.12 | $4,308,922 |
| Upstream HVAC | $3,064,203 | $0.72 | $2,202,953 |
| California Advanced Home Program | $2,710,211 | $1.01 | $2,742,647 |
| LAUSD Direct Install | $721,641 | $1.41 | $1,020,022 |
| Commercial Direct Install | $42,643,954 | $1.02 | $43,655,810 |
| Food Service Program | $265,427 | $1.13 | $300,225 |
| **Crosscutting Programs** | | | |
| City Plants | $2,280,000 | $1.53 | $3,497,218 |
| Codes, Standards & Ordinances | $624,106 | $24.73 | $15,434,657 |
| LADWP Facilities Upgrade | $2,652,853 | $1.10 | $2,925,750 |
| Program Outreach & Community Partnerships | $1,696,000 | $1.09 | $1,854,874 |
| Emerging Technologies | $620,546 | $0.94 | $585,411 |
| **TOTAL** | **$123,046,342** | **$1.36** | **$166,922,966** |

[12] In this study, a value added multiplier represents the dollar value of labor income, profits, and taxes in Los Angeles County for each dollar of direct LADWP investment.
[13] The dollar values reported here include direct, indirect, and induced forms of value added across all three investment streams: LADWP direct investment, co-investment, and energy cost-savings.
[14] See footnote above.

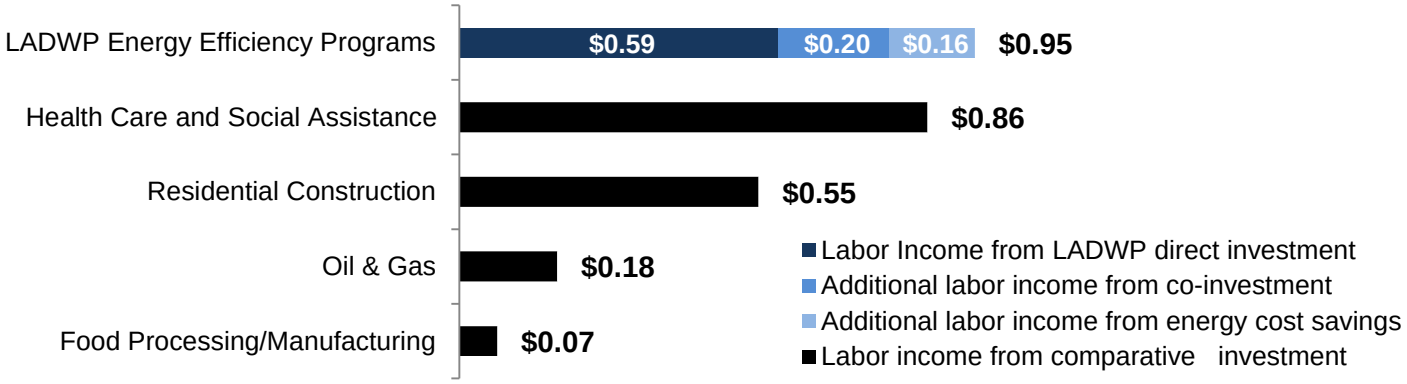
## 1.5 Regional Economic Benefits: Labor Income

Labor income is subset of value added and is a helpful measure for understanding how much wealth generated by an investment ends up in the collective hands of local workers and proprietors (i.e., self-employed individuals and unincorporated business owners).[15] Labor income is an aggregated measure of income and includes both wages and benefits.

**Table ES.5** summarizes the total dollar value in labor income generated by each program based on FY 2016-17 expenditures. Results are standardized per million dollars of LADWP investment (referred to as the program's labor income multiplier), and are also totaled according to FY 2016-17 funding levels. As with employment and value added multipliers, a program's labor income multiplier is influenced by the same set of factors (i.e., labor intensity; local sourcing; co-investment; and energy-cost savings). Thus, programs that have relatively large employment multipliers also tend to have large value added and labor income multipliers.

**Figure ES.4** visualizes how the average labor income multiplier for LADWP's energy efficiency programs compares to the four benchmark industries. When the effects of co-investment and energy cost savings are included, LADWP's energy efficiency programs generate more labor income (per million dollars of direct investment) than all four benchmark industries. Since labor income is a subset of value added, the labor income multipliers reported here are lower in absolute terms than the value added multipliers for each respective investment scenario. However, in relative terms, LADWP's energy efficiency programs take an even greater lead over most benchmark industries (excluding health care). This outcome suggests that labor income comprises a much greater portion of the value added by LADWP's energy efficiency programs than it does for food manufacturing, the oil and gas sector, and residential construction.

**Figure ES.4. Labor Income from Energy Efficiency Programs vs. Benchmark Industries[16]**
**(Labor Income for Los Angeles County per Dollar of Direct Investment)**




[15] The labor income generated by an investment is not always positively correlated to the compensation packages for individual workers impacted by that investment. In other words, investments that generate significant labor income may do so because they employ many low-wage workers. Analyzing the compensation packages for all workers impacted by LADWP investments, including workers along supply chains, was outside the scope of this study.

[16] The labor income multiplier for LADWP energy efficiency programs is a weighted average of the 22 programs in **Table ES.2** according to FY 2016-17 funding levels. Labor income multipliers for the four comparison industries do not include labor income generated by co-investment or energy cost savings. This additional labor income, however, was included in the multiplier for LADWP energy efficiency programs, which is intentionally designed to generate co-investment and reduce energy costs. See **Appendix 1** for the mix of industrial sectors that are included in each benchmark industry.

**Table ES.5. Labor Income from LADWP Energy Efficiency Programs in FY 2016-17**

| Program | FY 2016-17 Expenditures | Labor Income Multiplier[17,18] | Total Labor Income[19] |
|---|---|---|---|
| **Residential Mass Market Programs** | | | |
| Efficient Product Marketplace | $1,217,110 | $3.62 | $4,408,116 |
| Consumer Rebate Program | $8,198,835 | $2.84 | $23,321,771 |
| Home Energy Improvement | $8,999,943 | $1.14 | $10,281,752 |
| Refrigerator Exchange Program | $3,466,222 | $0.21 | $728,162 |
| Refrigerator Turn-In & Recycle | $429,021 | $1.71 | $760,598 |
| AC Optimization Program | $2,856,824 | $0.70 | $2,004,860 |
| Residential Lighting Efficiency Program | $18,725,769 | $0.18 | $3,312,568 |
| Energy Savings Assistance Program | $577,000 | $0.79 | $456,550 |
| Home Upgrade Energy Upgrade California | $956,938 | $3.49 | $3,336,674 |
| **Commercial, Industrial, and Institutional Programs** | | | |
| Commercial Lighting Incentive Program | $8,159,637 | $1.01 | $8,241,887 |
| Custom Performance Program | $8,334,517 | $1.02 | $8,501,675 |
| Savings by Design | $3,845,587 | $0.83 | $3,194,678 |
| Upstream HVAC | $3,064,203 | $0.43 | $1,315,383 |
| California Advanced Home Program | $2,710,211 | $0.67 | $1,825,826 |
| LAUSD Direct Install | $721,641 | $1.23 | $890,340 |
| Commercial Direct Install | $42,643,954 | $0.67 | $28,749,372 |
| Food Service Program | $265,427 | $0.92 | $243,402 |
| **Crosscutting Programs** | | | |
| City Plants | $2,280,000 | $0.84 | $1,919,116 |
| Codes, Standards & Ordinances | $624,106 | $14.53 | $9,070,774 |
| LADWP Facilities Upgrade | $2,652,853 | $0.99 | $2,618,123 |
| Program Outreach & Community Partnerships | $1,696,000 | $0.63 | $1,064,345 |
| Emerging Technologies | $620,546 | $1.15 | $714,956 |
| **TOTAL** | **$123,046,342** | **$0.95** | **$116,549,246** |

[17] In this study, a labor income multiplier represents the total dollar value of employee compensation and proprietor income generated in Los Angeles County by each dollar of direct LADWP investment.
[18] The dollar values provided here include direct, indirect, and induced forms of labor income. The dollar values listed here also include the additional labor income generated by co-investment and energy cost-savings for each dollar of direct LADWP investment.
[19] See footnote above.

## 1.6 Conclusions and Broader Policy Implications

This study confirms the findings from a growing body of literature that has assessed the employment benefits of investments in energy efficiency compared to investments in fossil fuel production. Across multiple geographic scales, energy efficiency measures outperform fossil fuel production in supporting jobs.[20,21,22] This study contributes to the literature by also looking at two key economic metrics, value added and labor income. The same conclusions can be drawn using these two metrics to compare the economic benefits of investments in energy efficiency to investments in fossil fuel production.

The employment, value added, and labor income multipliers for each program presented in this study can inform policy decisions to maximize the economic benefits of energy efficiency investments. Some programs support more local jobs than others given the same amount of investment. Similarly, some programs generate significantly more wealth for local workers and businesses. While these findings are helpful for understanding the scale at which different energy efficiency programs grow the regional economy, they are just a starting point for holistically understanding the economic benefits of different energy efficiency investments. A full account of the economic benefits of energy efficiency investments requires looking at job quality and the distribution of benefits across socioeconomic groups. These metrics were outside the scope of this study but could be the focus of future research that dives more deeply into the payroll data maintained by utilities and their contractors.[23]

However, the ultimate merit of each program should not be solely evaluated in terms of jobs or wealth generation. When making investment decisions, utilities must consider a number of factors, including statuary compliance, grid reliability, costs for ratepayers, greenhouse gas (GHG) emissions reductions, and associated improvements in air quality. Programs that have a low employment or value added multiplier may perform better according to other co-benefits, such as reducing pollution and improving associated environmental health outcomes. Broader analysis of the many co-benefits associated with energy efficiency programs is another worthy task for future research.

Across all of the energy efficiency programs studied here, there are some general principles for program design that can enhance the local employment and economic benefits of each public dollar. These include purchasing locally manufactured materials, contracting with local vendors for specialized services, and incentivizing the most cost-effective technologies for achieving energy cost savings. Leveraging co-investment for the financing of energy efficiency projects is another effective way to enhance the employment and economic benefits of each public dollar invested, but matching fund requirements should be carefully designed so as not to exclude the participation of low-income communities. Ideally, incentive levels for rebate programs should be tiered by income, which will maximize the leveraged funds that high-income households are willing to contribute to conservation, while reducing the barriers that low-income households face in realizing the benefits of energy saving technologies.

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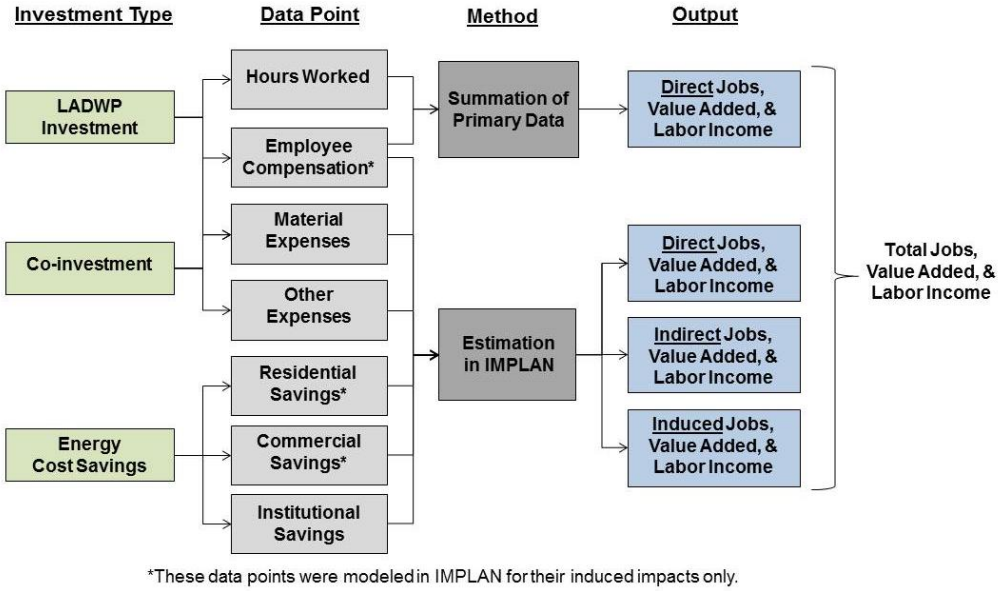
[20] Roland-Holst, David (2008). *Energy Efficiency, Innovation, and Job Creation in California.* Berkeley, CA: Center for Energy, Resources, and Economic Sustainability, University of California, Berkeley.
[21] Pollin, Robert, James Heintz, and Heidi Garrett-Petlier (2009). *The Economic Benefits of Investing in Clean Energy.* Amherst, MA: Department of Economics and Political Economy Research Institute (PERI), University of Massachusetts, Amherst.
[22] DeShazo, J.R., Alex Turek, and Michael Samulon (2014). *Efficiently Energizing Job Creation in Los Angeles.* Los Angeles, CA: Luskin Center for Innovation, University of California, Los Angeles.
[23] For more information about how payroll data can support this effort, see C. Zabin et al. (2014). *Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilitie*s. Retrieved from http://laborcenter.berkeley.edu/pdf/2014/WET-Plan-Appendices14.pdf

# 2. Methodology

The employment and economic benefits reported in this study were obtained through a combination two distinct methodologies. First, when possible, we used primary data to sum the total number of full-time equivalent (FTE) employees working on each energy efficiency program, as well as total spending on employee compensation. Second, we modeled all program expenditures in an economic input-output model (IMPLAN Version 3.1) to estimate the additional impacts that could not be deduced from primary data.

Economic input-output models such as IMPLAN estimate changes in employment and economic activity within a defined region based on a set of coefficients, or multipliers, for a given level of spending within an industry (e.g., construction, engineering, etc.). They are often used to evaluate the impact of an investment when gathering primary data about economic impacts is difficult or impossible. In this study, obtaining a complete picture of the employment and economic benefits of LADWP's energy efficiency programs requires tracking the direct, indirect, and induced impacts of each program.[24] Quantifying the sum total of these impacts using observational methods would require analyzing the unique supply chain of every impacted firm, as well as the unique spending pattern of every impacted household, worker, and proprietor. Given the infeasibility of such an undertaking, IMPLAN was used to model many of the employment and economic impacts from LADWP's energy efficiency programs. **Figure 1** provides an overview of impacts modeled in IMPLAN.

**Figure 1. Summary of Methods for Analyzing Employment and Economic Impacts**




[24] Direct impacts are the changes in employment and economic activity that occur upon the initial implementation of a program (e.g., an increase in demand for electricians and greater economic activity in the construction sector). Indirect impacts are those that occur along the supply chains that provide inputs or services to directly impacted industries (e.g., an increase in demand for truck drivers to deliver construction materials and greater economic activity in the transportation sector). Induced impacts are those that occur when households, workers, or proprietors receive and spend their income as a result of the direct and indirect impacts previously described (e.g., electricians and truck drivers spending their income on groceries, medical care, childcare, etc.), or as a result of energy cost-saving savings (e.g., LADWP ratepayers spending their financial savings on household or commercial expenses).

In order to model LADWP's energy efficiency programs in IMPLAN, the financial flows associated with each had to be tracked and totaled. The following section, **Scope of Study**, describes the criteria for determining which investments were included in the model (i.e., LADWP investment, induced co-investment, and energy cost savings). After quantifying investment totals, the details on how these financial flows were spent also had to be determined (i.e., affected industries, spending timeline, whether goods were purchased from retailers or producers, and the locations of those retailers and producers). The subsequent section, **Model Overview**, describes how IMPLAN translates all of this information into employment and economic benefits for the study region.

## 2.1 Scope of Study

Understanding the significance of the employment and economic benefits reported in this study requires a careful understanding of the scope of the study. Our findings reflect a specific study period, geographic boundary, and criteria for tallying financial investments, as highlighted below.

### Study Period

The findings from this study reflect funding levels for LADWP energy efficiency programs in fiscal year (FY) 2016-17. This period represented the most recent fiscal year for which there was detailed, program-level expenditure data. Funding levels are likely to change year to year, which in turn will affect the number of jobs supported, the value added, and labor income generated by each program in a given fiscal year. In order to estimate the employment and economic benefits of energy efficiency programs under different funding scenarios, the findings from this study can be standardized in terms of one million dollars of LADWP investment and then multiplied by future investment levels, assuming no major changes to program design or implementation took place.

### Study Region

This study focuses on the employment and economic benefits that are occurring in Los Angeles County as result of LADWP's energy efficiency programs. There are no data packages at the city level which can be modeled in IMPLAN, so Los Angeles County was defined as the study region instead of the City of Los Angeles. Since all findings are limited to Los Angeles County, they do not reflect the additional jobs, value added, and labor income generated in neighboring counties, states, and countries as a result of LADWP's investments in energy efficiency.

### Investment Types

Three types of investments were analyzed in this study: (1) LADWP investment; (2) co-investment; and (3) energy cost savings. LADWP investment represents the funds that LADWP spent on energy efficiency program in FY 2016-17. Co-investment represents the matching funds that consumers, businesses, and non-profit organizations contributed towards the purchase of an energy-saving technology or the implementation of a particular program. Energy cost savings represent the funds that go back to LADWP customers when they are able to reduce their energy bills by participating in an energy efficiency program. See **Table ES.2** for the value of each of these investment types by program.

LADWP's investment levels were obtained directly from LADWP. These numbers represent actual expenditures in FY 2016-17. The details of how these funds were spent across various cost categories (e.g., LADWP labor, materials, consultants, etc.) are summarized in the methodology subsection of each program chapter.

To determine the co-investment that was induced by a particular program, we relied on a variety of data sources, such as invoices for incentive programs that show out-of-pocket consumer and business expenses, as well as program budgets that delineate the sources of funds. The methodology subsection of each program chapter contains a short explanation of how induced co-investments were determined in the specific context of each program.

Energy cost savings were calculated by UCLA Luskin Center for Innovation researchers, but were derived from data provided by LADWP. For each energy efficiency program, LADWP estimates the number of kilowatt hours saved by program participants over the course of a fiscal year. LADWP also estimates the average cost of electricity (per kilowatt hour) for different classes of ratepayers (e.g., residential, commercial, intuitional, etc.) over the course of a fiscal year. The cost per kilowatt hour is an all-inclusive rate, accounting for taxes, fees and all other non-electricity costs that consumers are billed. From these two data points, the UCLA Luskin Center for Innovation was able to estimate the energy cost savings generated by each program. The methodology subsection of each program chapter explains how energy cost savings were apportioned to different customer classes, when applicable.

### Net Impacts

This study looks at the gross number of jobs supported by LADWP's suite of energy efficiency programs, and does not assess whether these jobs are net positive jobs (i.e., new jobs that would not have existed in the absence of LADWP's energy efficiency investments). Similarly, this study looks at the gross value added and labor income generated by LADWP's energy efficiency programs, and does not assess whether these dollar figures represent a net gain in value added or labor income for Los Angeles County. In order to develop net estimates, the employment and economic benefits reported in this study need to be compared with a counterfactual scenario that describes how investment dollars would have been spent in the absence of LADWP's energy efficiency programs. Developing a counterfactual scenario and analyzing its employment and economic benefits was outside the scope of this study. However, to provide the reader with context for understanding the benefit of LADWP's energy efficiency programs relative to other investment opportunities, each program chapter opens with a set of employment multipliers for benchmark industries. These benchmark industries were selected by the UCLA Luskin Center for Innovation for comparative purposes, and do not necessarily reflect LADWP's investment priorities.

## 2.2 Model Overview

Economic input-output models such as IMPLAN work by mapping the interdependent relationships between all of the industrial sectors in a defined economy. In other words, an economic input-output model shows how the outputs of one particular industry become the inputs of another, and vice versa. By mapping these interdependent relationships, the ripple effects of a change in one industry can be quantified across all others. For example, if there is a spike in energy efficient lighting sales, additional demand is placed on the electric lamp bulb and part manufacturing sector, which in turn places additional demand on supporting sectors such as glass manufacturers, wire manufacturers, delivery services, etc. An economic input-output model captures all of these ripple effects, and quantifies them according to a number of economic measures (e.g., jobs supported, value added, labor income, etc.), both across the entire economy and within each impacted industry.

This study focuses on the measures of employment, value added, and labor income. Employment impacts are measured in job-years, which represent the number of workers that are employed for one full year as a result of an investment flow.[25] Value added is essentially a measure of a gross domestic product (GDP), and represents the difference between the final price of goods and services produced by an investment and the cost of intermediate inputs consumed during production. In effect, value added is a measure of the additional wealth created by an investment that ends up in the form of wages for workers, profits, and taxes. Labor income is a subset of value added represents the total dollar value of employee compensation (wages and benefits) and proprietor income (payments received by self-employed individuals and unincorporated business owners).

The potential for a financial investment to stimulate employment, value added, and labor income ultimately varies by the industry in which that investment is spent. Since industries are heterogeneous in their production processes, they are also heterogeneous in their labor and capital needs. Service- related industries, for example, often support more jobs than manufacturing- related industries, given the same level of investment, because they rely on human labor rather than capital as their primary means of production.

Likewise, industries are also heterogeneous in the value they add to the local economy. The health care services and social assistance sector, for example, generate nearly 10 times as much value added to Los Angeles County's economy as food processing/manufacturing. This is likely the result of the workforce needs of the health care services and social assistance sector, which devotes a greater share of an initial investment to compensating employees than food processing/manufacturing. The labor income from a million-dollar investment in health care services and social assistance, for example, results in 12 times as much labor income than from food processing/manufacturing given the same level of investment.

Each industry has a unique set of multipliers that describe the magnitude of that industry's impact on employment, value added, and labor income. Thus, much of the research for this study involved identifying the appropriate industrial sectors in IMPLAN in which to code LADWP's investments in energy efficiency programs. In total, there are 536 industry codes in IMPLAN.[26] In general, IMPLAN's industry codes map very closely to the six-digit North American Industry Classification System (NAICS) codes, especially for manufacturing sectors. However, many of the service and construction sectors in IMPLAN have been consolidated into unique industry categories created by the Minnesota IMPLAN Group (e.g., maintenance and repair construction of residential structures). Given the general overlap between NAICS and IMPLAN industry codes, the 2012 NAICS definitions were used to infer which IMPLAN codes were most appropriate for describing the various activities funded by LADWP's energy efficiency programs.[27] The process of matching energy efficiency programs with IMPLAN codes was also informed by interviews with program managers and precedents set by other employment and

[25] In practice, one job-year may take the form of two employees for six months each, three employees for four months each, or any other combination of employees that adds up to one year's worth of labor. All job-years reported in this study have been converted to full-time equivalents (FTEs) because some industries employ a number of part-time workers, and a standard unit was needed for comparing the employment benefits of different investments.

[26] IMPLAN (2017). "IMPLAN Sectoring & NAICS Correspondences". Retrieved from https://implanhelp.zendesk.com/hc/en-us/articles/115009674428-IMPLAN-Sectoring-NAICS-Correspondences

[27] United States Census Bureau. "2012 NAICS Definitions". Retrieved from http://www.census.gov/eos/www/naics/2012NAICS/2012_Definition_File.pdf

economic studies. The methodology section of each program chapter details the various IMPLAN codes that were selected to model that program.

Another major research task was identifying how to allocate investment dollars when they involved multiple industries. The City Plants program, for example, led to spending in a number of industrial sectors (e.g., labor and civic organizations; greenhouse, nursery, and floriculture production; maintenance and repair construction of highways, streets, bridges, and tunnels; etc.). Determining how much money was spent in each of these sectors required interviewing staff members at LADWP and partner organizations (City Plants and the Los Angeles Conservation Corps), as well as reviewing the proposed budget and other supporting financial documentation. The assumptions used to allocate investment dollars to different industrial sectors are detailed in the methodology section of each program chapter.

The following subsections describe the model in more detail, including a description of the dataset used to build the model, relevant model inputs and outputs, specifications required by IMPLAN for each model input, and limitations that constrain the precision of model outputs.

### Model Data Package

The employment and economic multipliers reported in this study originate from data maintained by multiple sources including the U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, the U.S. Census Bureau, and other state and local sources.[28] The Minnesota IMPLAN Group then synthesizes these datasets into a single package that can be imported into the IMPLAN modeling software, and disaggregated by 536 industry categories at varying geographic scales (i.e., national, state, county, zip code).[29] This study utilized the 2014 IMPLAN data package for Los Angeles County. This dataset is unique to Los Angeles County, so the model's outputs did not need to be adjusted to reflect the county's economy. The model also adjusts for inflation, so investment values did not need to be modified before being entered into the model. However, a spending timeline had to be defined for each investment flow and is explained in each program chapter.

### Model Inputs

Investment dollars are the inputs into the model. This study specifically looks at three streams of investment associated with LADWP's suite of energy efficiency programs:

- **LADWP Investment:** Funds that LADWP spent on energy efficiency programs in FY 2016-17, including expenditures on labor performed by LADWP employees, materials, incentives, and services performed by outside contractors.
- **Co-investment:** Matching funds that consumers, businesses, and non-profit organizations contribute towards the purchase of an energy-saving technology or the implementation of a particular program.
- **Energy Cost Savings:** Funds that go back to LADWP customers when they reduce their energy bills by participating in an energy efficiency program. These funds are ultimately reinvested in the economy by ratepayers and businesses on a variety of household goods and services.

[28] IMPLAN (2015). "Comparison of IMPLAN Source Data for Employment and Labor Income". Retrieved from http://oldsupport.implan.com/index.php?option=com_content&view=article&id=450
[29] IMPLAN (2015). "United States Economic Data". Retrieved from http://www.implan.com/us-data/

This study looks at the combined effect of these three investment streams on employment, value added, and labor income in Los Angeles County. Investment totals are reported in each program chapter, and are summarized in the executive summary (see **Table ES.2**).

### Input Specifications

Once the financial flows associated with LADWP's energy efficiency programs were determined, certain specifications needed to be entered into IMPLAN to describe how these financial flows were spent. In other words, the model needs to be fine-tuned so that it can most accurately reflect reality. As previously discussed, identifying the most appropriate industrial sector(s) in which to code an investment is one of the most critical specifications in running the model. Other important specifications include the timing of how the investment is spent, the presence of pricing margins (i.e., transaction costs associated with retail and wholesale services), and the local purchase percentage (i.e., the percentage of funds that are spent within the study region). Each of these specifications ultimately affects how IMPLAN calculates the multipliers for an investment, as described below:

**Industrial Sector:** An industry's employment multiplier is influenced by: (1) the ratio between the cost of materials and labor within an industry and (2) the compensation and benefit packages paid to each employee.[30] An industry that is material intensive tends to support fewer jobs than an industry that is labor intensive, given the same level of financial investment. Similarly, industries that rely on high-skill workers tend to pay higher wages and provide more benefits than an industry that relies on low-skill labor, and thus supports fewer jobs given the same level of spending. The multipliers for value added and labor income are similarly influenced by the ratio between spending on materials and labor. Industries that are labor intensive direct more investment dollars to wages, increasing the total value added and labor income reported for those industries. Value added, however, is also influenced by the taxes and profits generated by an industry, such that an industry with low workforce needs and high profits could still generate more value added than an industry with high workforce needs and low profits. For this reason, value added and labor income are included as separate metrics throughout this report.

- **Spending Timeline:** The economic and employment benefits of an investment vary over time because of two factors: (1) inflation and (2) relative price changes over time. The effects of inflation reduce the purchasing power of today's dollars in the future. Thus, a delayed investment in that industry will be less valuable and support fewer jobs than an immediate investment. Holding the effects of inflation aside, the relative value of a good also changes over time. Some products become cheaper over time relative to other goods and services, while some products become more expensive.[31] If an industry's goods are increasing in relative value over time because raw materials are becoming

[30] IMPLAN has built-in assumptions for each industrial sector that reflect that sector's spending on materials versus labor, as well as how much that sector spends on employee compensation. Spending on employee compensation is reported in IMPLAN at the gross scale (i.e., total payroll costs, including benefits), not at the individual scale (i.e., salaries by occupation).

[31] Each industry in IMPLAN has built-in assumptions, or "deflators," to adjust for the changing value of that industry's outputs relative to other goods and services. These built-in deflators are based on historical data from the U.S. Bureau of Economic Analysis and an employment growth model from the U.S. Bureau of Labor Statistics. For more information, read the article "Margins & Deflators," published by IMPLAN: http://support.implan.com/index.php?option=com_content&view=article&id=397:397-transferred&catid=229:229#deflators

more expensive, then a future investment of a million dollars will ultimately buy less of that industry's goods compared to the same level of spending today (after adjusting for inflation). If less goods can be purchased for the same level of investment, less work is needed to produce those goods, fewer jobs are supported, less labor income is generated, and less value is added to the local economy.

- **Pricing Margins:** The presence of pricing margins determines how an investment gets distributed across a supply chain. If an investment is used to purchase goods from a retailer (e.g., department store, hardware store, etc.), then there are transaction costs associated with bringing those goods from the factory to the retail location. These transaction costs are referred to as pricing margins and are equal to the difference between the cost to the consumer and the cost the producer. In order to accurately model job flows, IMPLAN requires the user to specify whether the value of an investment includes pricing margins, so that it can distribute some portion of that investment to retail-, wholesale-, and transportation-related industries, thereby generating economic activity and supporting jobs in each of those industries.[32] If an investment goes directly to the producer, then pricing margins can be ignored, and the full value of the investment is assumed to be spent at the point of production. In summary, pricing margins shift the distribution of spending away from the point of production to a greater mix of supporting industries, each of which have a unique set of multipliers, which in turn affects the overall multiplier reported for a particular investment. The directionality of that effect varies from investment opportunity to investment opportunity, based on the factors described above and below. Pricing margins are only applicable to manufacturing industries because service industries are not purchased through a third-party retailer.

- **Local Purchase Percentage:** For the purposes of this study, the local purchase percentage refers to the share of expenditures that stay within Los Angeles County. Investments that are spent on industries comprised of firms that primarily operate outside of Los Angeles County will generate less economic benefits for the county and support fewer local jobs compared to industries with a strong local presence. A local purchase rate can be specified for each stage of the supply chain, from production to retail sectors.[33]

The specifications used to model all of the financial flows associated with LADWP energy efficiency programs are described in the methodology section of each program chapter**.**

### Model Outputs

Once the model is run, IMPLAN generates a series of output tables to show the direct, indirect, and induced impacts of a given level of spending on employment and economic outcomes. The definitions for each of these impacts are provided below:

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[32] When pricing margins are appropriate, IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing goods from a particular industry, as derived from data reported by the U.S. Bureau of Economic Analysis. For more information, read the article "Margins & Deflators," published by IMPLAN: http://support.implan.com/index.php?option=com_content&view=article&id=397:397-transferred&catid=229:229#deflators

[33] IMPLAN has built-in assumptions about the local purchasing patterns within each industry, so the user only needs to adjust this percentage when there is an exception to the norm. For more information about how these assumptions were construction, read the article "IMPLAN's Gravity Model and Tradeflow RPCs," published by IMPLAN: https://implanhelp.zendesk.com/hc/en-us/articles/115009674608-IMPLAN-s-Gravity-Model-and-Tradeflow-RPCs

- **Employment:** The number of job-years that are supported by an investment flow**.** Job-years are reported in IMPLAN without differentiation between full-time, part-time, and temporary jobs. In order to translate generic job-years into FTEs, IMPLAN provides a set of conversion coefficients for each industrial sector.[34] All job totals reported in this study have been converted to FTE job-years and are geographically constrained to Los Angeles County. Employment impacts can be disaggregated into the following three categories:
    - **Direct Jobs:** Positions that directly implement LADWP's suite of energy efficiency programs (e.g., administrative staff at LADWP, engineers conducting site visits, contractors installing energy-efficient appliances, etc.).
    - **Indirect Jobs:** The jobs along the supply chains that provide intermediate inputs for carrying out LADWP's energy efficiency programs (e.g., workers processing raw materials for the assembly of energy efficiency products, truckers delivering goods, vendors selling household appliances at retail locations, etc.).
    - **Induced Jobs:** The jobs that provide goods and services to workers with direct and indirect jobs when they spend their income, or to LADWP ratepayers when they spend their energy cost savings (i.e., grocery store clerks selling household products, afterschool providers caring for children, doctors treating patients, etc.).
- **Value Added:** Value added is the difference between an industry's gross output (sales or receipts and other operating income, plus inventory change) and the cost of intermediate inputs (consumption of goods and services purchased from other industries or imported). In essence, value added consists of compensation of employees, taxes on production and imports, and gross operating surplus. Thus, value added is a measure of the contribution to GDP made by an individual producer, industry, or sector. As with employment impacts, value added can disaggregated into three impact categories:
    - **Direct Value Added:** The value added that is created by the initial set of expenditures that occur during implementation of LADWP's energy efficiency programs (e.g., the wages and taxes paid by construction firms performing energy efficiency upgrades, the operating surplus for manufacturing industries that sell energy efficiency appliances to LADWP incentive recipients, etc.).
    - **Indirect Value Added:** The value added that is created along supply chains that provide intermediate inputs for carrying out LADWP's energy efficiency programs (e.g., the wages and taxes paid by trucking companies that delivery goods from manufacturing plants to retail locations, the operating surplus of the retailers that sell those goods, etc.).
    - **Induced Value Added:** The value added that is created when workers and proprietors in impacted industries spend their income, or when LADWP ratepayers spend their energy cost savings (e.g., the wages and taxes paid by restaurants who serve LADWP workers on their lunch breaks, the operating surplus of the real estate firms who sell or rent them homes, etc.).

[34] IMPLAN (2015). "536 FTE & Employment Compensation Conversion Table (2013)". Retrieved from http://oldsupport.implan.com/index.php?view=document&alias=4-536-fte-a-employment-compensation-conversion-table&category_slug=536&layout=default&option=com_docman&Itemid=1764

- **Labor Income:** Labor income encompasses all forms of employment income, including employee compensation (wages and benefits) and proprietor income (payments received by self-employed individuals and unincorporated business owners). Again, labor income can be disaggregated into three impact categories:
    - **Direct Labor Income:** The employment income created during the initial implementation of LADWP's energy efficiency programs (e.g., external contractors paying workers for installing energy efficiency upgrades, LADWP paying personnel for administrative services, etc.).
    - **Indirect Labor Income:** The employment income created along the supply chains that provide intermediate inputs for carrying out LADWP's energy efficiency programs (e.g., trucking companies paying drivers for delivering goods, retailers paying cashiers for customer service, etc.).
    - **Induced Labor Income:** The employment income when workers and self-employed proprietors in impacted industries spend their income, or when LADWP ratepayers spend their energy cost savings (i.e., restaurants paying cooks to prepare meals for LADWP workers, real estate agencies paying staff to process housing applications, etc.)

Unless otherwise stated, the job numbers and economic benefits reported in this study reflect the sum total of direct, indirect, and induced impacts. Disaggregated numbers are provided in the results section of each program chapter.

### Model Limitations

Input-output models have several advantages for estimating the economic benefits of investment decisions. They capture the economic and employment impacts across an entire economy (i.e., direct, indirect, and induced impacts) and they can be used to forecast impacts when data from the field is impossible to collect. These models, however, have a number of limitations that constrain their ability to perfectly quantify the economic and employment benefits of a given investment. The limitations of the input-output model used in this study (IMPLAN Version 3.1), are described below:

- **Static Relationships:** The interdependent relationships between economic sectors in IMPLAN are static (i.e., frozen in time), providing a snapshot of the economy in the year captured by the data package. In this study, the data package reflects industrial purchasing patterns in 2014. Thus, outputs from the model do not account for changes in consumer or industry behavior that may have occurred after 2014, such as an economic downturn or a technological innovation, which in turn could change industrial purchasing patterns. Similarly, IMPLAN does not account for price elasticity. In other words, the prices of goods and services are not affected by a surge of investment into the economy. For example, a construction boom, as modeled in IMPLAN, would not raise the price of building materials following a sudden influx in demand. Since the fluxes of investment analyzed here are relatively small compared to the size of the industrial sectors that they impact (in terms of total economic output), it is assumed that LADWP's energy efficiency programs have a negligible impact on prices within each sector. Thus, if price elasticity had been incorporated into the model, we would expect similar results.

- **Linear Relationships:** The relationships between economic sectors in IMPLAN are also linear. This means IMPLAN's multipliers are not sensitive to the magnitude of an investment. For example, the jobs supported by a $1 *billion* investment in urban forestry projects will be exactly 1,000 times greater than a $1 *million* investment in the same set of projects. In reality, industries face supply constraints, such that there may not actually be enough viable open space in cities to implement $1 billion worth of urban forestry projects. In addition, industries face declining marginal costs as their operations grow, allowing firms to devote more financial resources to salaries and benefits instead of capital costs. Again, since the investments analyzed here are relatively small compared to the size of the industrial sectors in which they are spent, we do not expect any significant supply constraints or changes in marginal costs from LADWP's investments. Thus, we would expect similar results if IMPLAN were a nonlinear model.

- **Timing of Impacts:** IMPLAN does not specify when impacts will actually be realized. The value added, labor income, and job totals that IMPLAN reports are based on the ripple effects that an influx of spending generates across an economy. Some of those effects will occur sooner than others. For example, an investment in refrigeration equipment manufacturing may create direct jobs and economic activity in that sector immediately, but the secondary industries that supply intermediate inputs (e.g., steel mills, copper refineries, plastic manufacturers, etc.) may need a ramp up period to respond to additional demand (i.e., time to extract raw materials, process those materials, transport those materials to the assembly site, etc.). Assessing how long each industry needs to respond to additional demand is difficult to predict, so IMPLAN does not provide a time range in which economic activities will be completed.

- **Job Quality:** Information about job quality is critical for assessing the impact of an investment on the economic well-being of hired workers. Unfortunately, IMPLAN does not provide sufficient information for assessing job quality, such as detailed data on wages by occupation, retirement packages, health benefits, paid leave, training opportunities, or prospects for career advancement. IMPLAN does provide information about the industrial sectors that are impacted by investment flows, including the number of job-years supported in each industry and total amount of employee compensation (salaries plus benefits) generated within each industry. While an average compensation package for each industry could be deduced from these outputs, such a metric would mask the significant wage disparity that exists in many industries, and was therefore not presented in this study.

- **Geographic Granularity:** IMPLAN does not provide data on the exact location of economic benefits, just the total value added, labor income, and job-years that are expected within a defined geographic boundary following an investment. In this study, the geographic boundary was defined as Los Angeles County. This boundary is larger than LADWP's actual service territory (the City of Los Angeles), but there are no data packages at the city level that can be modeled in IMPLAN. Thus the numbers presented in this study are likely larger than what would be observed if the model could be constrained for the City of Los Angeles.

# 3. Efficient Product Marketplace (EPM)

**Program Type:** Residential Mass Market

**Intervention Type**: Lighting, Refrigerator, Air Conditioning, Thermostat, Power Strips

**Budget in FY 2016-17:** $1,217,109

**Co-investment:** $7,696,648

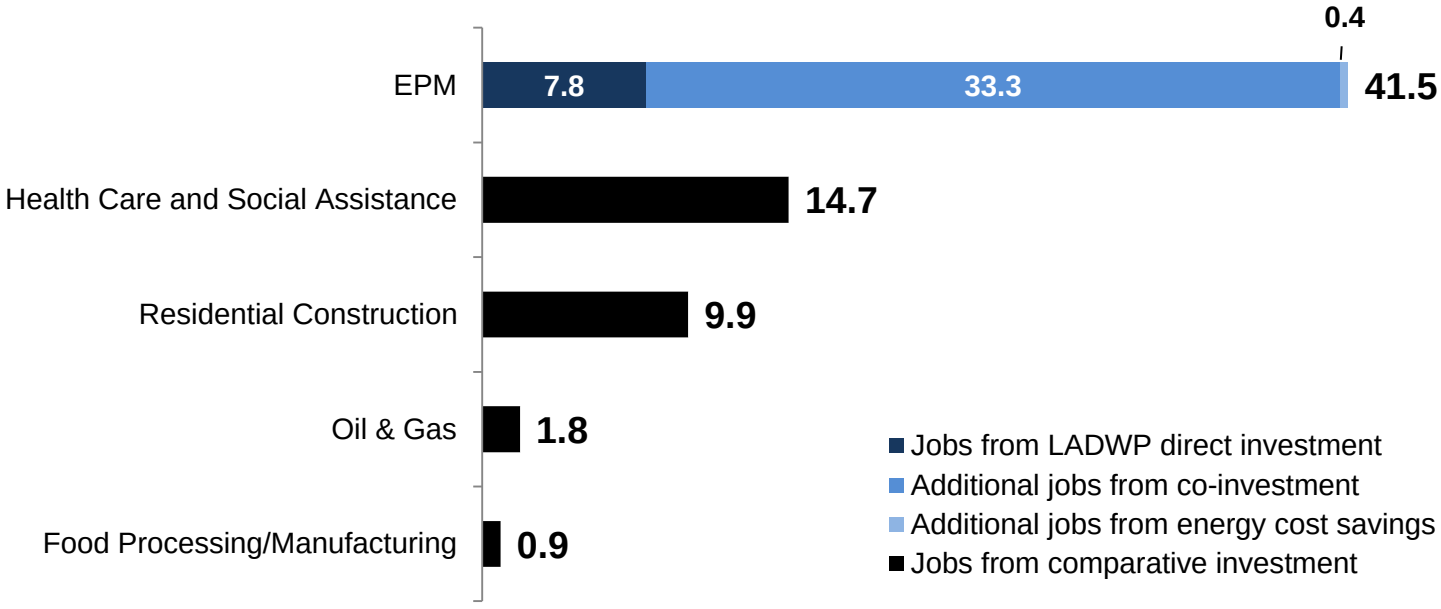
**Estimated Energy Cost Savings:** $78,282

**Employment Benefits:** 50.5 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $5,297,844 in Los Angeles County

**Labor Income:** $4,408,116 in Los Angeles County

**Jobs from EPM vs. Benchmark Industries[35]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[35] No co-investment or energy cost savings were modeled for benchmark industries.

## 3.1 Program Description

The Efficient Product Marketplace (EPM) program is designed to simplify shopping for energy efficient electronic products and streamline the rebate process. The key feature of EPM is its website, which provides a platform for customers to find energy efficient products, review details, and locate stores and online retailers. The website provides users with lists of eligible products, rebate information, energy savings estimates, Energy Star scores, product details, features, popularity/review ratings, an Eco review, and locations of where the product can be purchased within LADWP's service area. All rebate submissions can be made electronically: there is no paperwork to mail. Rebates are provided via a prepaid LADWP-branded gift card that can be used anywhere Visa credit cards are accepted. Rebates are typically issued within 10 business days.

The program targets residential customers, including both renters and homeowners. Eligible products include light-emitting diode (LED) lamps, refrigerators, window-mounted air conditioners, televisions, advanced power strips, and programmable thermostats. LADWP customers have two options for submitting applications for installed products: online or by mail. The online application provides quicker processing. The rebate is paid up to a set quantity of each product per customer. Rebate amounts vary based on the level of product efficiency.

## 3.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in EPM during fiscal year (FY) 2016-17, totaling $1,217,109, is supporting **9.5** full-time equivalent (FTE) job-years in Los Angeles County (or 7.8 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, consumers co-invested $7,696,648, supporting **40.5** FTE job-years (or 33.3 FTE job-years per million dollars of LADWP investment). The program also saved residential ratepayers $78,282 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **0.5** FTE job-years (or 0.4 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **50.5** FTE jobs-years in Los Angeles County (or 41.5 FTE job-years per million dollars of LADWP investment). See **Table 3.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[36]

**Table 3.1 Direct, Indirect, and Induced Jobs Supported by EPM[37]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,217,109) | 5.0 | 1.2 | 3.3 | **9.5** |
| Co-investment ($7,696,648) | 24.7 | 5.2 | 10.6 | **40.5** |
| Energy Cost Savings ($78,282) | - | - | 0.5 | **0.5** |
| **Total** | **29.7** | **6.3** | **14.4** | **50.5** |

[36] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[37] Disaggregated numbers may not add up to totals due to rounding

## 3.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from EPM, including value added and labor income. We estimate that LADWP's investment in EPM during FY 2016-17 added a total of **$5.3** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 83% of the total value added. See **Tables 3.2** and **3.3** for a summary of the direct, indirect, and induced impacts of EPM on value added and labor income, respectively, in Los Angeles County.[38]

**Table 3.2 Value Added by EPM[39]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,217,109) | $747,249 | $122,786 | $355,114 | $1,225,149 |
| Co-investment ($7,696,648) | $2,253,650 | $636,762 | $1,132,717 | $4,023,129 |
| Energy Cost Savings ($78,282) | - | - | $49,565 | $49,565 |
| **Total** | **$3,000,899** | **$759,548** | **$1,537,396** | **$5,297,844** |

**Table 3.3 Labor Income from EPM[40]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct[41] | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,217,109) | $759,472 | $82,372 | $200,562 | $1,042,406 |
| Co-investment ($7,696,648) | $2,336,386 | $361,728 | $639,791 | $3,337,905 |
| Energy Cost Savings ($78,282) | - | - | $27,805 | $27,805 |
| **Total** | **$3,095,858** | **$444,100** | **$868,158** | **$4,408,116** |

[38] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[39] Disaggregated numbers may not add up to totals due to rounding.
[40] See footnote above.
[41] Direct labor income exceeds direct value added because of negative profits for some impacted industries, as based on the year of the IMPLAN data package (2014).

## 3.4 Methodology

In order to estimate the employment and economic benefits of EPM, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 3.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 3% of the total jobs, 7% of the total value added, and 9% of the total labor income reported for EPM in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 3.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to EPM (including regular and overtime) translated to 1.6 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 32% of all program expenses.

### 3.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 3.4**.

#### LADWP Funding

In FY 2016-17, a total of $3,845,587 in LADWP funding was expended on EPM. Funds were spent on a mix of LAWDP labor, overhead costs, incentives, and outside services provided by Enervee, an energy efficiency commerce platform, which included online platform maintenance, customer engagement, and rebate processing. See **Appendix 3.1** for a summary of how LADWP's program funds were spent according to cost category.

### Co-investment

The incentives offered through EPM do not completely offset the cost of the product purchased by the consumer. EPM participants, therefore, are considered co-investors (with LADWP) in the adoption of energy efficient technologies. The difference between the purchase price of the product and the rebate was modeled as the co-investment for each purchase. Based on a sample of 2,930 rebates issued during FY 2016-17, totaling $201,435, consumers co-invested $2,814,094. Assuming that the observed ratio between LADWP incentives and co-investment (1 to 14) is representative of all the rebates issued, it is projected that the full $550,932 that LADWP spent on incentives in FY 2016-17 corresponds to $7,696,648 in co-investment.

### Energy Cost Savings

LADWP estimates that EPM saved a total of 495,454 kilowatt hours (kWh) in FY 2016-17. The energy savings are calculated by choosing a common baseline annual energy consumption (AEC) relative to the energy efficiency index (EEI) corresponding to the products scoring at the 55th percentile of the score distribution. For example, in the case of LEDs, the energy consumed by a product with an EEI score in the 90$^{th}$ percentile is compared to the energy consumed by product with an EE score in the 55$^{th}$ percentile, assuming the same amount of lumens are produced by each product. The difference between the two energies was then shown as the energy savings.

Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came out to $78,282. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by EPM, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

LADWP spending on incentives was modeled in IMPLAN as a mix of industries, as based on the sample of 2,930 rebates provided by LADWP. Most incentive funds were issued to consumers that purchased refrigerators (modeled in IMPLAN as household refrigerator and home freezer manufacturing), followed by thermostats (modeled automatic control manufacturing), air conditioners (modeled as air conditioning, refrigeration, and warm air

heating equipment manufacturing), light bulbs (electric lamp bulb and part manufacturing), televisions (audio and video equipment manufacturing), and power strips (all other miscellaneous electrical equipment and component manufacturing), in respective order. See **Appendix 3.1** for a summary of how LADWP spending on incentives was modeled in IMPLAN.

Program funds spent on outside services (Enervee) were modeled as architectural, engineering, and related services. This industry represents Enervee's primary set of business activities, rather than the specific activities that Enervee performed for EPM (i.e., online platform maintenance, customer engagement, and rebate processing). Since IMPLAN relies upon industry averages for modeling employment and economic impacts, Enervee's primary business activities were assumed to be the best proxy for modeling its hiring and spending practices.

The same mix of industries used to model LADWP spending on incentives was also used to model co-investment. These two investment streams (LADWP investment and co-investment) ultimately go towards the cost of purchasing a new energy efficient appliance, thus they are modeled as spending within the industry that produced that appliance. The percentages assigned to each industry within that mix were based on the actual co-investment levels documented in the sample of 2,930 rebates provided by LADWP. See **Appendix 3.1** for a summary of how co-investment was modeled in IMPLAN.

Since EPM benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[42]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that all program funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

[42] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of EPM customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

In the case of this program, it is assumed that consumers are purchasing their equipment from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all manufacturing sectors (i.e., household refrigerator and home freezer manufacturing; automatic environmental control manufacturing; air conditioning, refrigeration, and warm air heating equipment manufacturing; electric lamp bulb and part manufacturing; audio and video equipment manufacturing; and all other miscellaneous electrical equipment and component manufacturing).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling funds that went to household income and architectural, engineering, and related services (i.e., Enervee's services).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all EPM staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Likewise, Enervee is located in Culver City, so a 100% local purchase rate was applied to spending on architectural, engineering, and related services.

IMPLAN's default local purchase rates were applied to spending on all energy efficient appliances. The default local purchase rate at the retail stage of the supply chain was nearly 100% for all manufacturing sectors. However, the local purchase rates at the manufacturing stage are particularly low (ranging between 0.02% and 6.95%) because few appliance manufacturers have production facilities located in Los Angeles County. Validating IMPLAN's built-in local purchase rates against actual sourcing and production information was outside the scope of this study.

EPM requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for the customers who benefit from the program.

# 4. Consumer Rebate Program (CRP)

**Program Type:** Residential Mass Market

**Intervention Type**: Windows, Heating and Air Conditioning, Pool Pump, Cool Roof, Whole House Fan

**Budget in FY 2016-17:** $8,198,835

**Estimated Co-investment:** $35,469,456

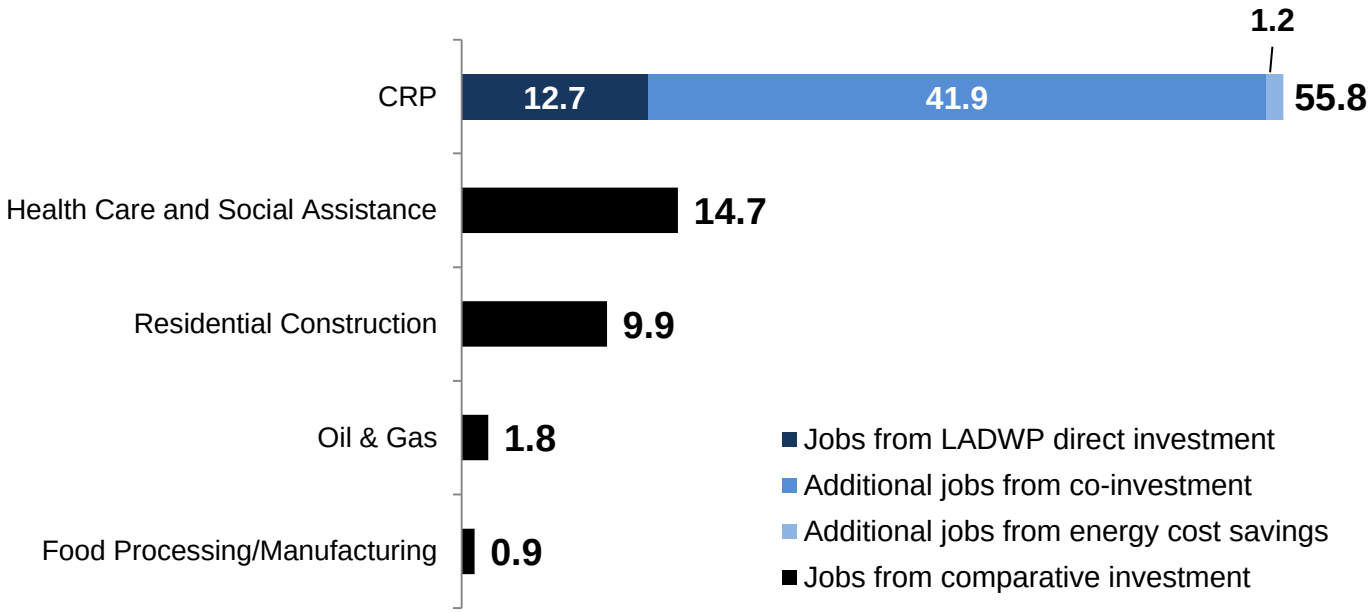
**Estimated Energy Cost Savings:** $1,654,538

**Employment Benefits:** 457.3 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $33,671,492 in Los Angeles County

**Labor Income:** $23,321,771 in Los Angeles County

**Jobs from CRP vs. Benchmark Industries[43]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[43] No co-investment or energy cost savings were assumed for benchmark industries.

## 4.1 Program Description

The Consumer Rebate Program (CRP) offers incentives to its residential customers to promote a range of energy efficiency measures to improve the performance and comfort of their homes, including cool roofs, Energy Star windows, whole house fans, efficient heating and air conditioning systems, and variable speed pool pumps. CRP is designed to offer and promote specific and comprehensive energy solutions within the residential market sector.

In order to obtain a rebate under this program, the customer purchases and installs the product, completes a rebate application and submits the application, proof of purchase and other supporting documentation to the LADWP Rebate Processing Center. The Consumer Rebate Program Group reviews the application: documentation and a rebate check is issued upon approval. An inspection may be conducted by LADWP to verify the installed items.

## 4.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in CRP during fiscal year (FY) 2016-17, totaling $8,198,835, is supporting **103.9** full-time equivalent (FTE) job-years in Los Angeles County (or 12.7 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, we estimate that consumers co-invested $35,164,001, supporting **343.7** FTE job-years (or 41.9 FTE job-years per million dollars of LADWP investment). The program also saved residential ratepayers $1,752,943 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **9.8** FTE job-years (or 1.2 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **457.3** FTE-jobs years in Los Angeles County (or **55.8** FTE job-years per million dollars of LADWP investment). See **Table 4.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[44]

**Table 4.1 Direct, Indirect, and Induced Jobs Supported by CRP[45]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,198,835) | 78.2 | 7.8 | 17.9 | **103.9** |
| Co-investment ($35,164,001) | 222.7 | 66.2 | 54.7 | **343.7** |
| Energy Cost Savings ($1,654,538) | - | - | 9.8 | **9.8** |
| **Total** | **300.9** | **74.0** | **82.3** | **457.3** |

[44] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[45] Disaggregated numbers may not add up to totals due to rounding.

## 4.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from CRP, including value added and labor income. We estimate that LADWP's investment in CRP during FY 2016-17 added a total of **$33.7** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 69% of the total value added. See **Tables 4.2** and **4.3** for a summary of the direct, indirect, and induced impacts of CRP on value added and labor income, respectively, in Los Angeles County.[46]

**Table 4.2 Value Added by CRP[47]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,198,835) | $4,515,659 | $927,394 | $1,902,473 | **$7,345,526** |
| Co-investment ($35,164,001) | $12,454,331 | $7,016,830 | $5,807,184 | **$25,278,344** |
| Energy Cost Savings ($1,654,538) | - | - | $1,047,622 | **$1,047,622** |
| **Total** | **$16,969,990** | **$7,944,224** | **$8,757,279** | **$33,671,492** |

**Table 4.3 Labor Income from CRP[48]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,198,835) | $3,982,192 | $540,079 | $1,074,832 | **$5,597,103** |
| Co-investment ($35,164,001) | $9,876,235 | $3,979,422 | $3,281,322 | **$17,136,979** |
| Energy Cost Savings ($1,654,538) | - | - | $587,689 | **$587,689** |
| **Total** | **$13,858,427** | **$4,519,501** | **$4,943,843** | **$23,321,771** |

[46] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[47] Disaggregated numbers may not add up to totals due to rounding.
[48] See footnote above.

## 4.4 Methodology

In order to estimate the employment and economic benefits of CRP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 4.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 1% of the total jobs, 4% of the total value added, and 6% of the total labor income reported for CRP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 4.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to CRP (including regular and overtime) translated to 5.6 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 18% of all program expenses.

### 4.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 4.1**.

#### LADWP Funding

In FY 2016-17, a total of $8,198,835 in LADWP funding was expended on CRP. Funds were spent on a mix of LAWDP labor, overhead costs, and incentives. See **Appendix 4.1** for a summary of how these program funds were spent according to cost category.

## Co-investment

The incentives offered through CRP do not completely offset the cost of the product purchased by the consumer. CRP participants, therefore, are considered co-investors (with LADWP) in the adoption of energy efficient technologies. The difference between the purchase price of the product and the rebate was modeled as the co-investment for each purchase. To estimate co-investment levels, CRP program staff identified the rebates they found to be broadly representative of the projects incentivized by the program. **Table 4.4** summarizes the estimated co-investment levels for reach rebate type, based on a sample of rebate applications provided by LADWP.

**Table 4.4 Estimated Co-investment Levels for CRP by Rebate Type**[49]

| Rebate Type | Number of rebates | Total Paid | Co-investment to rebate ratio | Estimated Co-investment | Scaled Up Estimated Co-investment* |
|---|---|---|---|---|---|
| HVAC | 516 | $221,180 | 67.3 | $14,900,774 | $15,030,210 |
| Windows | 129 | $69,218 | 16.3 | $1,127,106 | $1,136,897 |
| Cool Roof | 657 | $438,231 | 19.2 | $8,399,950 | $8,472,916 |
| Whole House Fan | 3 | $600 | 6.3 | $3,780 | $3,813 |
| Pool Pump | 6,209 | $5,931,749 | 1.8 | $10,732,393 | $10,825,620 |
| **Total** | **7,514** | **$6,660,978** | **5.3** | **$35,164,001** | **$35,469,456** |

*The scaled up co-investment levels assume that all LADWP funds allocated for rebates in FY 2016-17 ($6,718,839) are eventually spent on rebates.

## Energy Cost Savings

LADWP estimates that CRP saved a total of 10,471,757 kilowatt hours (kWh) in FY 2016-17. Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came to $1,654,578. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

## Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CRP, funds were tracked according to how they were spent.

[49] Several rebate types were excluded from the rebate totals reported in **Table 4.4** (i.e., rebates for refrigerators and room air conditioning units) because these items were phased out of the program at the beginning of FY 2016-17.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employment compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

LADWP spending on incentives was modeled in IMPLAN as a mix of industries, based on the sample of rebates provided by LADWP. Pool pump replacements involved the greatest number of industries, since they are the only rebates within CRP that allow the consumer to recover installation costs. In addition to the cost of the pool pump itself (modeled in IMPLAN as pump and pumping equipment manufacturing), project costs included installation labor (modeled as services to building and dwellings), pipes and fittings (modeled as plastics pipe and pipe fitting manufacturing), valves (valve and fittings other than plumbing manufacturing), control devices (modeled as automatic environmental control manufacturing), electrical conduit (modeled as wiring device manufacturing), miscellaneous plumbing materials (modeled as retail stores - building material and garden supply), and the pool pumps themselves (modeled as pump and pumping equipment manufacturing). Pool pumps also comprised the greatest share of rebate funds; followed by cool roofs (modeled as asphalt shingle and coating materials manufacturing); heating, ventilation, and air conditioning (HVACs: modeled as air conditioning, refrigeration, and warm air heating equipment manufacturing); windows (modeled as glass product manufacturing made of purchased glass); and whole house fans (air purification and ventilation equipment manufacturing). See **Table 4.4** for a summary of much incentive funding was paid out to each rebate type, and **Appendix 4.1** for a summary of how this spending was modeled in IMPLAN.

The industries impacted by co-investment were also based on the sample of rebates provided by LADWP, which showed out-of-pocket expenses for participants. The sample HVAC rebate did not have itemized expenses, so all HVAC co-investment was modeled in IMPLAN as maintenance and repair construction of residential structures, an industrial sector which includes both material and labor costs associated with repair construction. The sample rebates for energy efficient windows provided more detail, showing costs related to windows, installation labor (modeled as maintenance and repair construction of residential structures), permits (modeled as employment and payroll only (state and local government, non-education), miscellaneous materials such as trim, sealant, and plugs (modeled as retail stores - building material and garden supply). The sample cool roof rebates and whole house fans also provided detail for breaking out permit costs, but labor and miscellaneous material costs were often consolidated, so they were modeled together as maintenance and repair construction of residential structures. In the case of pool pumps, incentive dollars, and co-investment dollars cover the same set of costs, so the same mix of industries used to model LADWP spending on incentives for pool pumps was also used to model co-investment for pool pumps. See **Table 4.4** for a summary of co-investment levels estimated for each rebate type, and **Appendix 4.1** for a summary of how this spending was modeled in IMPLAN.

Since CRP benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This

economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[50]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that all program funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it was assumed that consumers (or the contractors they hire) are purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all manufacturing sectors (i.e., air conditioning, refrigeration, and warm air heating equipment manufacturing; glass product manufacturing made of purchased glass; asphalt shingle and coating materials manufacturing; pump and pumping equipment manufacturing; automatic environmental control manufacturing; plastics pipe and pipe fitting manufacturing; and wiring device manufacturing).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in household income and all service-related sectors (i.e., services to buildings and dwellings; maintenance, and repair construction of residential structures).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

[50] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of CRP customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all CRP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Spending on external contractors to perform installations services, however, was modeled using IMPLAN's default local purchase rates, since detailed sourcing information on all the contractors hired by consumers was unavailable.

IMPLAN's default local purchase rates were applied to consumer spending on all energy efficient appliances and materials purchased by program participants. The default local purchase rate at the retail stage of the supply chain ranged between 80% and 100% for the impacted manufacturing sectors. However, the local purchase rates at the manufacturing stage were lower (ranging between 1% and 96%) because most impacted manufacturing sectors are not concentrated in Los Angeles County. Validating IMPLAN's built-in local purchase rates against actual sourcing and production information was outside the scope of this study.

CRP requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for the customers who benefit from the program.

# 5. Home Energy Improvement Program (HEIP)

**Program Type:** Residential Mass Market

**Intervention Type**: Building Envelope Weatherization, Lighting, Heating/Air Conditioning, Water Conservation

**Budget in FY 2016-17:** $8,999,942

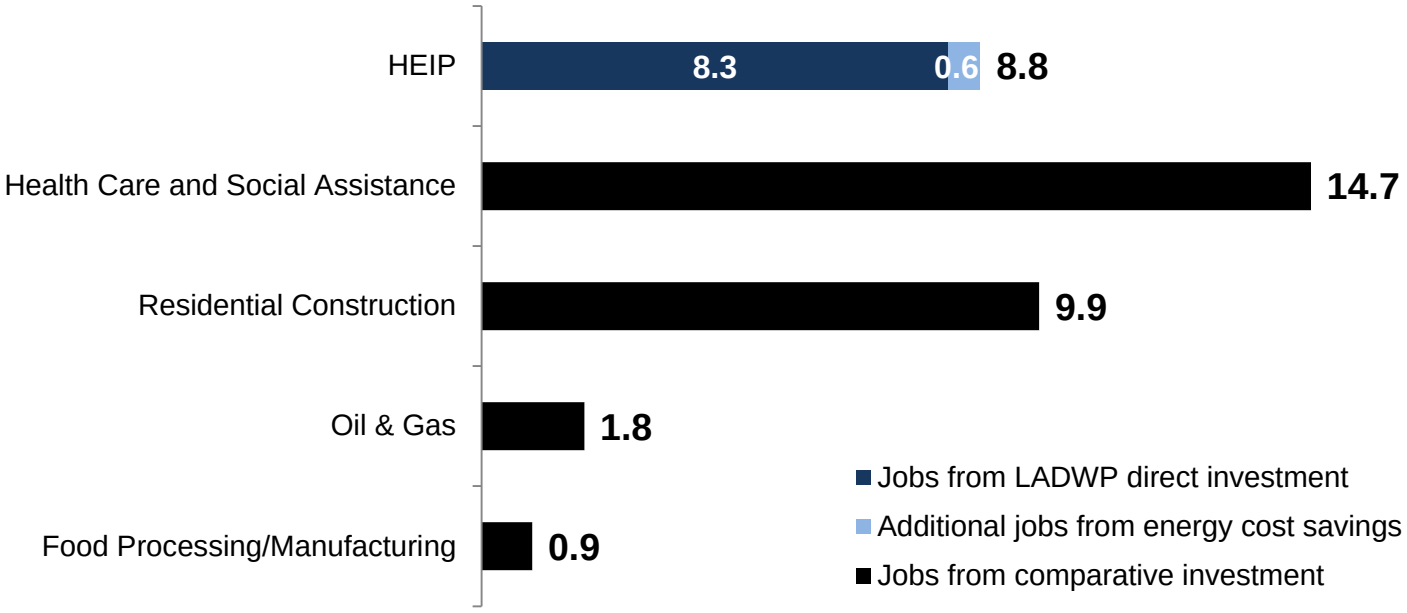
**Estimated Energy Cost Savings:** $736,334

**Employment Benefits:** 79.5 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $11,924,780 in Los Angeles County

**Labor Income:** $10,281,752 in Los Angeles County

**Jobs from HEIP vs. Benchmark Industries[51]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[51] No energy cost savings were assumed for benchmark industries.

## 5.1 Program Description

The Home Energy Improvement Program (HEIP) is a comprehensive direct install whole-house retrofit program that offers residential customers a full suite of free products and services to improve the energy and water efficiency of their home by upgrading/retrofitting the home's envelope and core systems. The program is targeted to primarily serve LADWP's low-, moderate-, and fixed-income single- and multi-family residential customers. No income restrictions are in place but the program is primarily marketed to these customer segments.

The energy and water saving potential within each residence is determined by a detailed assessment that identifies and estimates the basis for a remediation/retrofit plan. The assessments are performed by the Power Construction Maintenance (PCM) staff at LADWP and presented to each LADWP customer as a free service. The customer is presented with the findings at the conclusion of the residential assessment and informed of recommended measures to be installed. The majority of installations occur the day of the assessment. A follow-up appointment may be required for some measures and are scheduled by PCM office staff.

## 5.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in HEIP during fiscal year (FY) 2016-17, totaling $8,999,942, is supporting **74.4** full-time equivalent (FTE) job-years in Los Angeles County (or 8.3 FTE job-years per million dollars of LADWP investment). The program also saved residential ratepayers $736,334 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **5.1** FTE job-years (or 0.6 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **79.5** FTE-jobs years in Los Angeles County (or 8.8 FTE job-years per $1 million of LADWP investment). See **Table 5.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[52]

**Table 5.1. Direct, Indirect, and Induced Jobs Supported by HEIP[53]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,999,942) | 46.2 | 1.0 | 27.2 | **74.4** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($736,334) | - | - | 5.1 | **5.1** |
| **Total** | **46.2** | **1.0** | **32.4** | **79.5** |

[52] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[53] Disaggregated numbers may not add up to totals due to rounding.

## 5.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from HEIP, including value added and labor income. We estimate that LADWP's investment in HEIP during FY 2016-17 added a total of **$11.9** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 86% of the total value added. See **Tables 5.2** and **5.3** for a summary of the direct, indirect, and induced impacts of HEIP on value added and labor income, respectively, in Los Angeles County.[54]

**Table 5.2 Value Added by HEIP[55]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,999,942) | $8,352,550 | $122,122 | $2,897,662 | **$11,372,334** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($736,334) | - | - | $552,446 | **$552,446** |
| **Total** | **$8,352,550** | **$122,122** | **$3,450,108** | **$11,924,780** |

**Table 5.3 Labor Income from HEIP[56]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,999,942) | $8,264,544 | $70,253 | $1,636,344 | **$9,971,141** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($736,334) | - | - | $310,611 | **$310,611** |
| **Total** | **8,264,544** | **$70,253** | **$1,946,955** | **$10,281,752** |

[54] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[55] Disaggregated numbers may not add up to totals due to rounding.
[56] See footnote above.

## 5.4 Methodology

In order to estimate the employment and economic benefits of HEIP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 – Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 5.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 52% of the total jobs, 67% of the total value added, and 77% of the total labor income reported for HEIP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 5.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to HEIP (including regular and overtime) translated to 41.3 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 88% of all program expenses. Employees include program management staff, administrative staff and a number of job classes within the PCM group, which performs the assessments and efficiency measure installations.

### 5.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 5.1**.

#### LADWP Funding

In FY 2016-17, a total of $8,999,942 in LADWP funding was expended on HEIP. Funds were spent on a mix of LAWDP labor, overhead costs, materials, and services provided by external vendors (i.e., printing services). See **Appendix 5.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

HEIP does not require any matching funds from benefiting households or building owners. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that HEIP saved a total of 6,187,681 kilowatt hours (kWh) in FY 2016-17. This estimate is based on the energy savings potential of the variety of products installed and the weatherization measures performed in customer homes.

It is assumed that all HEIP participants are enrolled in the low-income discount rate program because HEIP is primarily marketed to low-, moderate-, and fixed-income single- and multi-family residential customers. In practice, some low-income customers may not be taking advantage of these discount rates, thus paying the standard residential rate. Assessing the degree to which that may be true for HEIP was outside of the scope of this study. Assuming that all HEIP customers are on the low-income discount rate is also a conservative assumption because it translates to less overall energy cost savings for residential customers.

Using an average per kilowatt cost for low-income residential customers of $0.119, the value of the energy savings came out to $736,335. The $0.119 energy cost came from a LADWP energy sales report that took a moving average of total kilowatt hours consumed by residential customers with the low-income discount rate and divided it by total revenue from these customers. This is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by HEIP, funds were tracked according to how they were spent.

Program funds spent on LADWP energy efficiency labor and PCM labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

LADWP spending on materials was modeled in a variety of industries, based on a sample of project invoices provided by LADWP. Most of these industries represent manufacturing sectors that produce the materials purchased for the home retrofits. Some LADWP funds under this cost category, however, went towards the cost of securing attic insulation permits, which was modeled in IMPLAN as spending on employment and payroll only (local government, non-education) because it is assumed that these permit fees ultimately pay for the payroll costs

associated with public agency employees that review permit applications. See **Appendix 5.1** for a summary of how LADWP spending on materials was modeled in IMPLAN.

LADWP also spent funds on printing and mailing services provided by outside vendors. These costs were modeled as printing in IMPLAN.

Since HEIP benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[57]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it is assumed that PCM crew members are purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all material expenses.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in household income and permitting costs.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN

[57] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of HEIP customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.3** for a summary of these assumptions.

already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with an 81% local purchase rate. In other words, around 81% of spending on employee compensation went to residents of Los Angeles County. This percentage was based on the percentage of LADWP staff members who work on HEIP and live in Los Angeles County, but does not account for individual salaries or hours worked.

All materials purchased by HEIP workers were assumed to be sourced from local retailers. However, IMPLAN's default local purchase rates were applied to the manufacturing stage along each manufacturing sector's supply chain. These local manufacturing percentages are relatively low because few manufacturers have production facilities located in Los Angeles County (ranging between 0.20% and 8.20%). Validating IMPLAN's built-in local purchase rates against actual sourcing and production information was outside the scope of this study.

HEIP requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for the customers who benefit from the program.

# 6. Refrigerator Exchange Program (REP)

**Program Type:** Residential Mass Market

**Intervention Type**: Refrigerator

**Budget in FY 2016-17:** $3,466,223

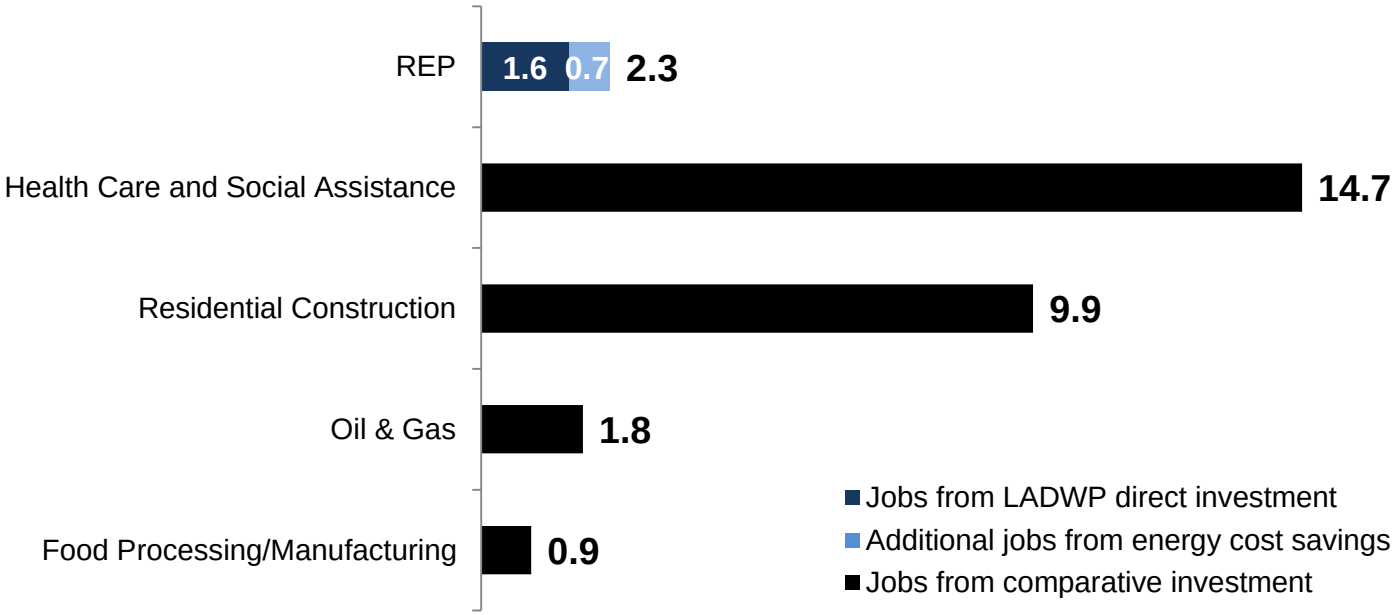
**Estimated Energy Cost Savings:** $395,376

**Employment Benefits:** 8 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $1,048,315 in Los Angeles County

**Labor Income:** $728,162 in Los Angeles County

**Jobs from REP vs. Benchmark Industries[58]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[58] No energy cost savings were assumed for benchmark industries.

## 6.1 Program Description

Refrigerator Exchange Program (REP) is a free refrigerator replacement program designed to target customers that qualify for either LADWP's Low-Income or its Senior Citizen/Disability Lifeline Rates. The program was expanded to include the following entities: multi-family or mobile home communities; civic, community, faith-based organizations; and educational institutions. The program provides refrigerators for these customer segments because many have older, less efficient refrigerators that are more expensive to operate, requiring additional LADWP energy procurement resources and add unnecessary greenhouse gas emissions into the environment.

This program leverages a third-party contractor, Appliance Recycling Centers of America, Inc. (ARCA), to administer the delivery of the program, while LADWP oversees and manages ARCA and the program. In addition to providing a new, energy-efficient refrigerator, REP also retrieves and disposes of the existing refrigerator in an environmentally responsible manner, ensuring that they are taken off the grid forever. The ARCA team cuts the cord on old refrigerators immediately upon replacement, transports the old refrigerator back to ARCA's local recycling facility, and recycles virtually all of the refrigerator components, including potentially hazardous materials.

## 6.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in REP during fiscal year (FY) 2016-17, totaling $3,466,223, is supporting **5.5** full-time equivalent (FTE) job-years in Los Angeles County (or 1.6 FTE job-years per million dollars of LADWP investment). The program also saved qualifying residential ratepayers $395,376 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **2.5** FTE job-years (or 0.7 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **8** FTE jobs-years in Los Angeles County (or 2.3 FTE job-years per $1 million of LADWP investment). See **Table 6.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[59]

**Table 6.1. Direct, Indirect, and Induced Jobs Supported by REP[60]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,466,223) | 2.7 | 0.9 | 1.8 | **5.5** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($395,376) | - | - | 2.5 | **2.5** |
| **Total** | **2.7** | **0.9** | **4.4** | **8.0** |

[59] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[60] Disaggregated numbers may not add up to totals due to rounding.

## 6.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from REP, including value added and labor income. We estimate that LADWP's investment in REP during FY 2016-17 added a total of **$1** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 69% of the total value added. See **Tables 6.2** and **6.3** for a summary of the direct, indirect, and induced impacts of REP on value added and labor income, respectively, in Los Angeles County.[61]

**Table 6.2 Value Added by REP[62]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,466,223) | $476,014 | $103,840 | $196,145 | $776,000 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($395,376) | - | - | $272,315 | $272,315 |
| **Total** | $476,014 | $103,840 | $468,460 | $1,048,315 |

**Table 5.3 Labor Income from REP[63]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,466,223) | $398,358 | $65,999 | $110,772 | $575,129 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($395,376) | - | - | $153,033 | $153,033 |
| **Total** | $398,358 | $65,999 | $263,805 | $728,162 |

[61] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[62] Disaggregated numbers may not add up to totals due to rounding.
[63] See footnote above.

## 6.4 Methodology

In order to estimate the employment and economic benefits of REP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review the **Chapter 2 – Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 6.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 12% of the total jobs, 25% of the total value added, and 37% of the total labor income reported for REP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 6.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to REP (including regular and overtime) translated to 0.93 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 8% of all program expenses.

### 6.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 6.1**.

#### LADWP Funding

In FY 2016-17, a total of $3,466,223 in LADWP funding was expended on REP. Funds were spent on LADWP labor and services provided by an external vendor (ARCA). See **Appendix 6.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

REP is designed to serve low-income customers and does not require any matching funds from benefiting households or building owners. Thus, no co-investment was modeled for REP.

### Energy Cost Savings

LADWP estimates that REP saved a total of 3,576,388 kilowatt hours (kWh) in FY 2016-17. This estimate was calculated by multiplying the number of program participants by the estimated kWh savings value per exchange. According to LADWP staff, around 95% of these energy savings are realized by residential customers and 5% are realized by commercial customers (i.e., civic organizations, community organizations, faith-based organizations, and educational institutions).

A couple of key assumptions had to be made for modeling energy cost savings. First, it is assumed that all REP participants are enrolled in one of the discount rate programs, as this reflects the majority of program participants. In reality, some REP participants may not be taking advantage of these discount rates, thus paying the standard residential rate. Assessing the actual rates that REP participants pay was outside of the scope of this study. Assuming that all REP customers are on a discount rate is also a conservative assumption because it translates to less overall cost savings for residential customers. Second, the mix of discount rates among REP participants was assumed to mirror that of the entire LADWP customer base receiving a discount (see **Appendix 2.2** for the mix of discount rates that were modeled).

A total of three different customer rates were ultimately used to model REP's overall energy cost savings. An average per kilowatt cost of $0.153 for was assumed for commercial customers, $0.119 was assumed for customers with the low-income discount rate, and $0.106 was assumed for customers participating in all other discount rate programs. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total kilowatt hours consumed by commercial customers and divided it by total revenue from commercial customers. The same method was used to obtain the average kilowatt energy cost for each discount residential rate. These are all-inclusive numbers, accounting for taxes, fees, and other related costs that customers are billed for electricity usage. In total, the energy cost savings modeled for REP for came to $395,376.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by REP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Program funds spent on outside services went to ARCA, the third-party contractor responsible for implementing the program. According to a sample of invoices provided by LADWP, ARCA spent most of these funds on procuring refrigerators and freezers (modeled in IMPLAN as household refrigerator and home freezer manufacturing). The remaining funds were spent on onsite inspections, delivery, installation, collection, and recycling (all of which were modeled in IMPLAN as waste management and remediation services).

Energy cost savings for residential customers were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[64]

Energy cost savings for commercial customers were modeled as an increase in proprietor income. This economic activity averages together the many ways in which self-employed individuals and unincorporated business owners may spend an increase in income.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

With respect to spending on refrigerators, pricing margins were applied to ARCA's spending on these appliances. ARCA purchases refrigerators from a distributor (Appliance Smart), so pricing margins were applied to account for the transaction costs that occur between manufacturing and retail stages of the supply chain.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling funds that went towards an increase in household income, proprietor income, and waste management and remediation services.

[64] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of REP customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.3** for a summary of these assumptions.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all REP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Likewise, ARCA has a regional office Santa Fe Springs, California so a 100% local purchase rate was applied to spending on waste management and remediation services.

All of the refrigerators and freezers purchases by ARCA were manufactured by General Electric, which does not have any manufacturing facilities located in Los Angeles County. Thus, the local purchase rate for the manufacturing stage of household refrigerator and home freezer manufacturing was assumed to be zero. Likewise, the distributor (Appliance Smart) did not have any known locations in Los Angeles County, so the local purchase rate at the retail stages of the supply chain was also assumed to be zero. Default local purchase rates, however, were assumed for the transportations stages of the supply chain.

REP requires that all refrigerator replacements occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household and proprietor income (vis-à-vis energy cost savings) for participating customers.

# 7. Refrigerator Turn-in & Recycle (RETIRE) Program

**Program Type:** Residential Mass Market

**Intervention Type**: Refrigerator/Freezer

**Budget in FY 2016-17:** $429,474

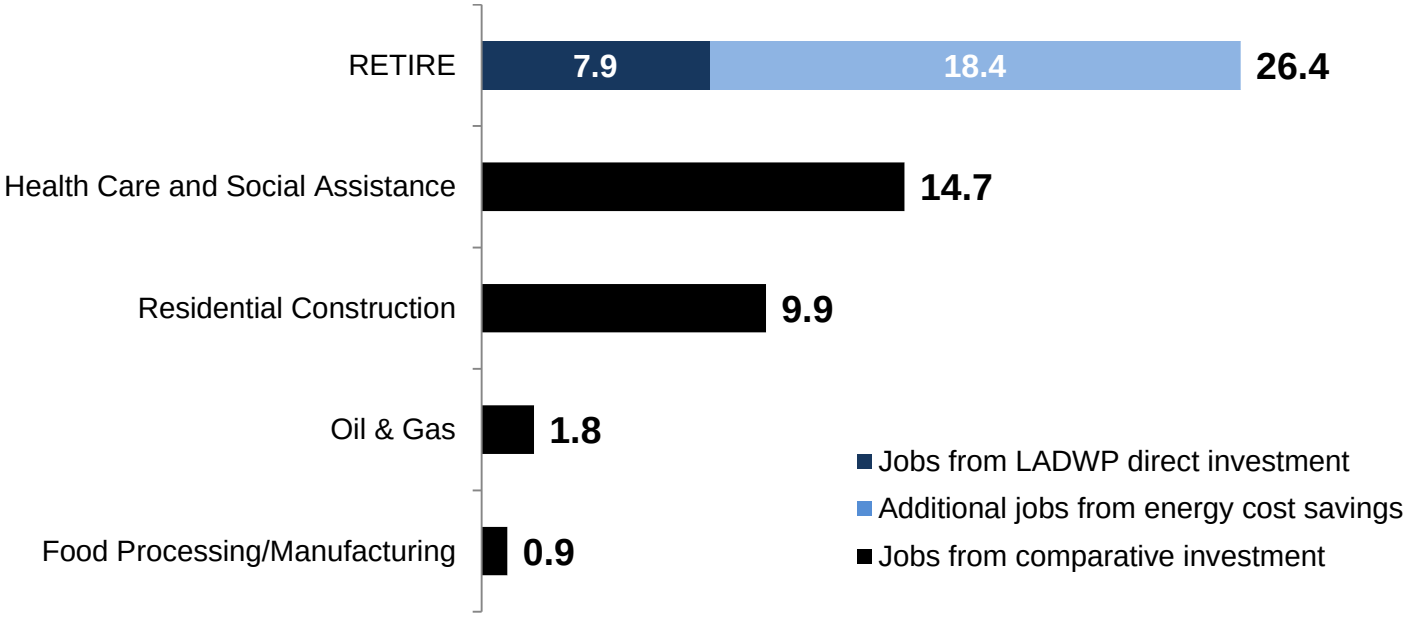
**Estimated Energy Cost Savings:** $1,342,713

**Employment Benefits:** 11.3 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $1,275,033 in Los Angeles County

**Labor Income:** $760,598 in Los Angeles County

**Jobs from RETIRE vs. Benchmark Industries[65]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[65] No energy cost savings were assumed for benchmark industries.

## 7.1 Program Description

The Refrigerator Turn-in and Recycle (RETIRE) Program is designed to target LADWP residential customers that have either made a retail purchase of a new refrigerator or freezer and/or those that have two, three, or more refrigerators or freezers in the household. This program offers a monetary incentive ($50) to residential customers to turn-in old refrigerators and freezers. Eligible units must be fully operational, and satisfy age and size requirements.

This program leverages a third-party contractor, Appliance Recycling Centers of America, Inc. (ARCA), to administer the delivery of the program, and Enervee to administer the issuance of rebates. Meanwhile LADWP oversees and manages the program. The RETIRE Program picks up and safely and environmentally recycles old, energy-wasting refrigerators and freezers at no cost to the customer and rewards customers with a $50 rebate. The customer also benefits from ongoing energy cost savings associated with the new refrigerator and the light-emitting diode (LED) light bulbs.

## 7.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in RETIRE during fiscal year (FY) 2016-17, totaling $429,474, is supporting **3.4** full-time equivalent (FTE) job-years in Los Angeles County (or 7.9 FTE job-years per million dollars of LADWP investment). The program also saved residential customers $1,342,713 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **7.9** FTE job-years (or 18.4 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **11.3** FTE jobs-years in Los Angeles County (or 26.4 FTE job-years per $1 million of LADWP investment). See **Table 7.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[66]

**Table 7.1 Direct, Indirect, and Induced Jobs Supported by RETIRE[67]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($429,474) | 1.6 | 0.7 | 1.1 | **3.4** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,342,713) | - | - | 7.9 | **7.9** |
| **Total** | **1.6** | **0.7** | **9.0** | **11.3** |

[66] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[67] Disaggregated numbers may not add up to totals due to rounding.

## 7.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from RETIRE, including value added and labor income. We estimate that LADWP's investment in RETIRE during FY 2016-17 added a total of **$1.3** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 60% of the total value added. See **Tables 7.2** and **7.3** for a summary of the direct, indirect, and induced impacts of RETIRE on value added and labor income, respectively, in Los Angeles County.[68]

**Table 7.2 Value Added by RETIRE[69]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($429,474) | $229,003 | $78,812 | $117,070 | **$424,885** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,342,713) | - | - | $850,148 | **$850,148** |
| **Total** | **$229,003** | **$78,812** | **$967,218** | **$1,275,033** |

**Table 7.3 Labor Income from RETIRE[70]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($429,474) | $167,355 | $50,312 | $66,020 | **$283,687** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,342,713) | - | - | $476,911 | **$476,911** |
| **Total** | **$167,355** | **$50,312** | **$542,931** | **$760,598** |

[68] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced economic impacts..
[69] Disaggregated numbers may not add up to totals due to rounding.
[70] See footnote above.

## 7.4 Methodology

In order to estimate the employment and economic benefits of RETIRE, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review the **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 7.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 2% of the total jobs, 5% of the total value added, and 9% of the total labor income reported for RETIRE in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 7.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to RETIRE (including regular and overtime) translated to 0.24 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 15% of all program expenses.

### 7.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 7.1**.

#### LADWP Funding

In FY 2016-17, a total of $429,474 in LADWP funding was expended on RETIRE. Funds were spent on labor, overhead costs, materials, and services provided by two external vendors, ARCA and Enervee. ARCA provided recycling services while Enervee processed the rebates and distributed the incentives to program participants. See **Appendix 7.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

RETIRE is a unique program in LADWP's suite of energy efficiency programs because it encourages conservation through the retirement of an appliance, rather than the replacement of an appliance with a more efficient version. Thus, RETIRE participants are not required to contribute any matching funds towards the program. Since there are no program participation costs for the customer, no co-investment was modeled.

### Energy Cost Savings

LADWP estimates that RETIRE saved a total of 8,498,182 kilowatt hours (kWh) in FY 2016-17. Savings were calculated by multiplying the number of participants by the estimated kWh savings value per unit recycled.

Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came out to $1,342,713. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. It is an all-inclusive number, accounting for taxes, fees, and all other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by RETIRE, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Funding paid to ARCA was modeled in IMPLAN as waste management and remediation services. This is a broad industry that includes establishments engaged in local hauling of waste materials, operating materials recovery facilities, providing remediation services, and other miscellaneous waste management services.

Modeling the funds that went to Enervee was less straightforward. Funds for rebate processing were modeled as architectural, engineering, and related services. This industry represents Enervee's primary set of business activities, rather than the specific activities that the company performed for RETIRE. Since IMPLAN relies upon industry averages for modeling employment and economic impacts, Enervee's primary business activities were assumed to be the best proxy for modeling its hiring and spending practices. Funds that went to Enervee for rebates were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods

and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[71]

Energy cost savings were also modeled as increase in household income in IMPLAN. Thus, no distinction was made within the model regarding the ways in which RETIRE participants spend the income from their gift card and their energy cost savings.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, pricing margins were not applicable for modeling an increase in household income. Moreover, engineering services and waste management and remediation services are not purchased through a third-party retailer, so pricing margins were not applicable for these industrial sectors in IMPLAN.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all RETIRE staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Likewise, Enervee is based in Culver City and ARCA has a regional office in Santa Fe Springs, both of which are located in Los Angeles County, so a 100% local purchase rate was applied to spending on management consulting services and waste management and remediation services.

[71] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. See **Appendix 2.1** for a summary of the income groups that were assumed for RETIRE's residential customers.

RETIRE requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for homeowners who benefit from the program.

# 8. Air Conditioning Optimization Program (ACOP)

**Program Type:** Residential Mass Market

**Intervention Type**: Air Conditioning

**Budget in FY 2016-17:** $2,856,824

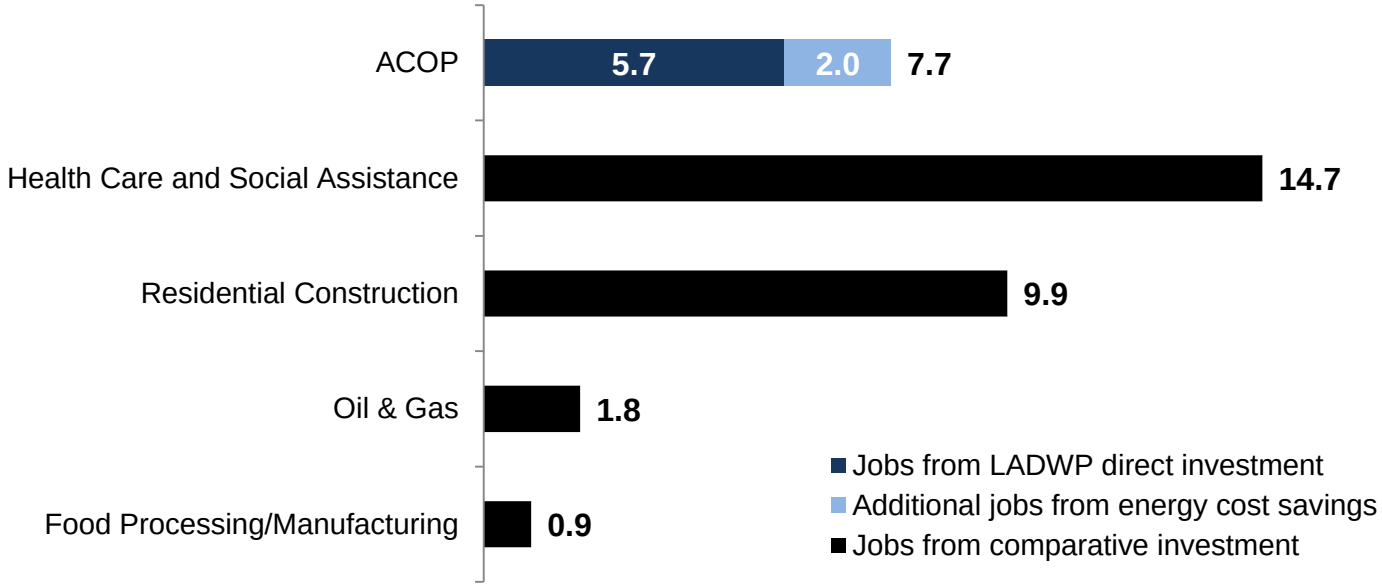
**Estimated Energy Cost Savings:** $1,025,357

**Employment Benefits:** 22 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $2,687,723 in Los Angeles County

**Labor Income:** $2,004,860 in Los Angeles County

**Jobs from ACOP vs. Benchmark Industries[72]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[72] No energy cost savings were assumed for benchmark industries.

## 8.1 Program Description

The Air Conditioning Optimization Program (ACOP) provides services by certified air conditioning (AC) technicians to analyze cooling systems and provide basic maintenance and efficiency services. The tune-up service includes outdoor coil cleaning, replacement or cleaning of standard air filter, a diagnostic test, and a refrigerant level adjustment (if needed). This service is free for all eligible residential and commercial LADWP customers. All technicians assigned to the LADWP program are trained and certified professionals.

In addition to maintenance efficiency checks, the program also offers a free Wi-Fi enabled smart thermostat, including installation, to participants who do not already have a smart programmable thermostat. Some AC systems may not be compatible with the brand of thermostat offered in the program. If customers elect to purchase a Wi-Fi enabled thermostat other than what is provided in the program, they may apply for a rebate through the Efficient Product Marketplace.

## 8.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in ACOP during fiscal year (FY) 2016-17, totaling $2,856,824, is supporting **16.2** full-time equivalent (FTE) job-years in Los Angeles County (or 5.7 FTE job-years per million dollars of LADWP investment). The program also saved residential customers $1,392,523 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **5.7** FTE job-years (or 2.0 job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **22** FTE jobs-years in Los Angeles County (or **7.7** FTE job-years per $1 million of LADWP investment). See **Table 8.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[73]

**Table 8.1 Direct, Indirect, and Induced Jobs Supported by ACOP[74]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,856,824) | 8.0 | 2.9 | 5.3 | **16.2** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,025,357) | - | - | 5.7 | **5.7** |
| **Total** | **8.0** | **2.9** | **11.0** | **22.0** |

[73] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[74] Disaggregated numbers may not add up to totals due to rounding.

## 8.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from ACOP, including value added and labor income. We estimate that LADWP's investment in ACOP during FY 2016-17 added a total of **$2.7** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 75% of the total value added. See **Tables 8.2** and **8.3** for a summary of the direct, indirect, and induced impacts of ACOP on value added and labor income, respectively, in Los Angeles County.[75]

**Table 8.2 Value Added by ACOP[76]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,856,824) | $1,203,156 | $302,790 | $564,516 | **$2,070,462** |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($1,025,357) | - | - | $617,261 | **$617,261** |
| **Total** | **$1,203,156** | **$302,790** | **$1,181,777** | **$2,687,723** |

**Table 8.3 Labor Income from ACOP[77]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,856,824) | $1,153,049 | $186,346 | $318,875 | **$1,658,270** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,025,357) | - | - | $346,590 | **$346,590** |
| **Total** | **$1,153,049** | **$186,346** | **$665,465** | **$2,004,860** |

[75] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced economic impacts.
[76] Disaggregated numbers may not add up to totals due to rounding.
[77] See footnote above.

## 8.4 Methodology

In order to estimate the employment and economic benefits of ACOP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review the **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 8.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 6% of the total jobs, 22% of the total value added, and 30% of the total labor income reported for ACOP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 8.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to ACOP (including regular and overtime) translated to 1.3 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 21% of all program expenses.

### 8.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on incentives and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 8.1**.

#### LADWP Funding

In FY 2016-17, a total of $2,856,824 in LADWP funding was expended on ACOP. Funds were spent on labor, overhead costs, materials, and services. See **Appendix 8.1** for a summary of how these program funds were spent according to different cost categories.

### Co-investment

ACOP does not require any matching funds from benefiting households or building owners. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that ACOP saved a total of 6,520,555 kilowatt hours (kWh) in FY 2016-17 According to LADWP staff, around 85% of these energy savings were realized by residential customers and 15% were realized by commercial customers. Using an average per kilowatt cost of $0.158 for residential ratepayers and $0.153 for commercial ratepayers, the total value of the energy savings came out to $1,025,357. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. The same method was used to obtain the $0.153 energy cost for commercial ratepayers. These are all-inclusive numbers, accounting for taxes, fees, and all other related costs that customers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by ACOP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Spending on outside services (i.e., CLEAResult) was modeled in a variety of industries, as based on 11 invoices provided by LADWP. Most of these funds were spent on thermostats (modeled in IMPLAN as automatic environmental control manufacturing). Payments to subcontractors were the second greatest expense under this cost category. These subcontractors were hired to perform the maintenance and efficiency services. According to LADWP, approximately 15% of customers during FY 2016-17 were commercial and 85% were residential. Assuming the expense of a commercial project is the same as a residential project, 15% of the subcontractor funds were modeled in IMPLAN as spending on maintenance and repair construction of nonresidential buildings and 85% were modeled as spending on maintenance and repair construction of nonresidential buildings. The remaining funds paid to CLEAResult were for administration, customer support, data collection, marketing, and other management activities, all of which were modeled as management consulting services in IMPLAN. See **Appendix 8.1** for a summary how payments to CLEAResult were modeled.

Miscellaneous material expenditures were modeled as spending on retail – building material and garden supply. This industrial sector is used when the exact type of materials is unknown, but the materials are likely construction products, tools, and other hardware. When modeled in

IMPLAN, this sector captures the employment and economic impacts of the retail activities associated with selling building and garden materials, but not the manufacturing impacts.

Energy cost savings for residential customers were modeled in IMPLAN as an increase in household income, which averages together the many ways in which a household will spend an increase in income, including both savings and the purchase of goods and services.[78] Likewise, Energy cost savings for commercial customers were modeled as an increase in proprietor income. This economic activity averages together the many ways in which self-employed individuals and unincorporated business owners may spend an increase in income.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it is assumed that CLEAResult is purchasing smart programmable thermostats directly from the manufacturer (Nest Labs) rather than from a third-party retailer. Thus, no pricing margins were assumed for spending on automatic environmental control manufacturing in IMPLAN. In contrast, it is assumed that LADWP is purchasing all of its miscellaneous materials from a third-party retailer, so pricing margins were applied to these funds (modeled as retail - building material and garden supply).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, margins were not applicable for modeling an increase in household and proprietor income.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN

[78] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. See **Appendix 2.1** for a summary of the income groups that were assumed for ACOP's residential customers.

already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all ACOP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Likewise, CLEAResult has a regional office in the City of Los Angeles, so a 100% local purchase rate was applied to spending on management consulting services.

Detailed information was not available on the locations of contractors that installed energy efficiency upgrades. Some of these contractors may be located outside of Los Angeles County, while still performing work in Los Angeles County, so the default local purchase rate was assumed for spending on maintenance and repair construction of residential (73.34%) and nonresidential buildings (75.14%).

All of the thermostats were manufactured by Nest Labs, which does not have any manufacturing facilities located in Los Angeles County. Thus, the local purchase rate for spending on automatic environmental control manufacturing was assumed to be zero. Miscellaneous material expenditures are assumed to be purchased through local retailers. Thus, a local purchase rate of 100% was applied to retail - building material and garden supply.

ACOP requires that all AC maintenance occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household and proprietor income (vis-à-vis energy cost savings) for participating customers.

# 9. Residential Lighting Efficiency Program (RLEP)

**Program Type:** Residential Mass Market

**Intervention Type**: Lighting

**Budget in FY 2016-17:** $18,725,770

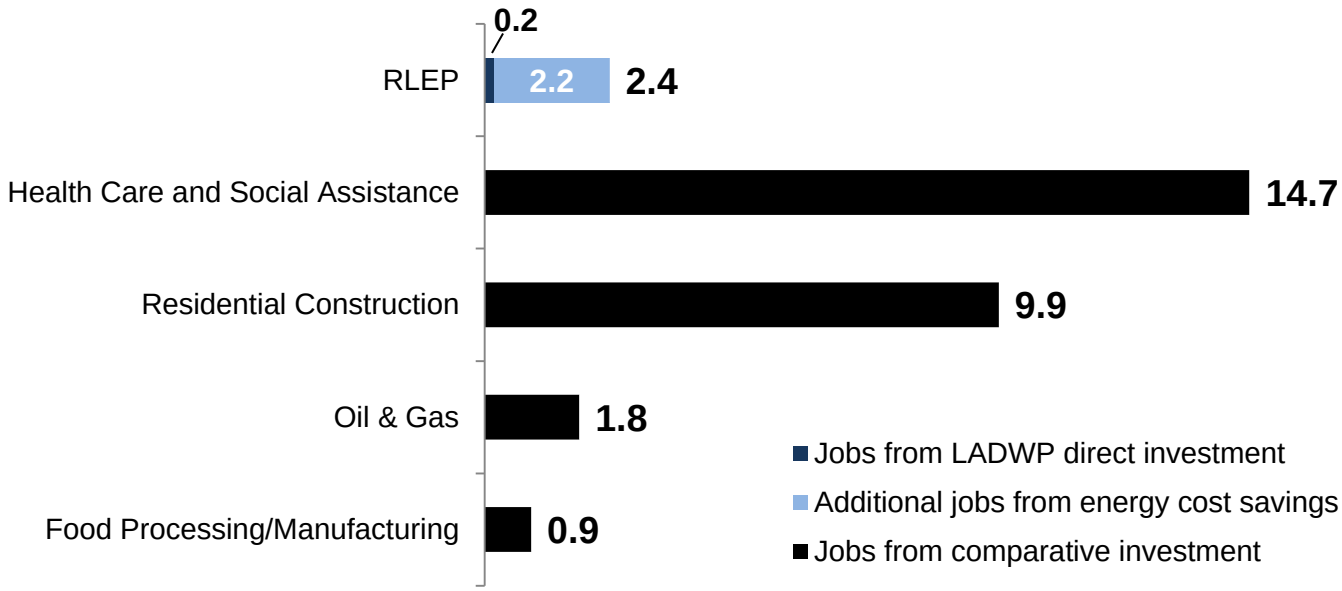
**Estimated Energy Cost Savings:** $7,644,367

**Employment Benefits:** 45 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $5,401,850 in Los Angeles County

**Labor Income:** $3,312,568 in Los Angeles County

**Jobs from RLEP vs. Benchmark Industries[79]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[79] No energy cost savings were assumed for benchmark industries.

## 9.1 Program Description

The Residential Lighting Efficiency Program (RLEP) provides light-emitting diode (LED) lamps to customers to assist in reducing their home electrical use. The LED lamps are being introduced to residents via two program channels: Direct-to-Door and Point-of-Sale (POS).

The Direct-to-Door strategy is intended to encourage customers to become familiar with the LED technology and its energy-saving benefits. Through this strategy, customers receive two free LED lamps along with conservation literature and messaging that strongly encourages the recipient to immediately install the lamps so that they can start saving on their lighting costs. There will be three rounds of the Direct-to-Door deliveries. Each round will encompass the entire residential customer base. The first round (September to November 2016) provided nearly 2.8 million LEDs to 1.4 million residential customers. The second round (March to June 2018) is also expected to reach 1.4 million customers and provide 2.8 million LEDs. The third round is anticipated to begin in late 2018.

Once the customer realizes the benefits of the LED lamps through the Door-to-Door strategy, the POS strategy will offer them an opportunity to purchase LEDs at a discount at home improvement and other commercial stores within LADWP's service territory. Customers will receive the discount at the cash register. LADWP is considering implementation of the POS strategy in the future, but details have not yet been determined.

## 9.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in RLEP during fiscal year (FY) 2016-17, totaling $18,725,769, is supporting **3.3** full-time equivalent (FTE) job-years in Los Angeles County (or 0.2 FTE job-years per million dollars of LADWP investment). The program also saved residential customers $7,644,367 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **41.7** FTE job-years (or 2.2 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **45** FTE-jobs years in Los Angeles County (or 2.4 FTE job-years per million dollars of LADWP investment). See **Table 9.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[80]

**Table 9.1 Direct, Indirect, and Induced Jobs Supported by RLEP[81]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($18,725,770) | 0.8 | - | 2.6 | **3.3** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($7,644,367) | - | - | 41.7 | **41.7** |
| **Total** | **0.8** | - | **44.3** | **45.0** |

[80] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[81] Disaggregated numbers may not add up to totals due to rounding.

## 9.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from RLEP, including value added and labor income. We estimate that LADWP's investment in RLEP during FY 2016-17 added a total of **$5.4** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 61% of the total value added. See **Tables 9.2** and **9.3** for a summary of the direct, indirect, and induced impacts of RLEP on value added and labor income, respectively, in Los Angeles County.[82]

**Table 9.2 Value Added by RLEP[83]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($18,725,770) | $646,861 | - | $274,426 | $921,287 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($7,644,367) | - | - | $4,480,563 | $4,480,563 |
| **Total** | **$646,861** | **-** | **$4,754,989** | **$5,401,850** |

**Table 9.3 Labor Income from RLEP[84]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($18,725,770) | $646,861 | - | $154,969 | **$801,830** |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($7,644,367) | - | - | $2,510,738 | **$2,510,738** |
| **Total** | **$646,861** | **-** | **$2,665,707** | **$3,312,568** |

[82] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[83] Disaggregated numbers may not add up to totals due to rounding.
[84] See footnote above.

## 9.4 Methodology

In order to estimate the employment and economic benefits of RLEP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 9.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 2% of the total jobs, 12% of the total value added, and 20% of the total labor income reported for RLEP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 9.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to RLEP (including regular and overtime) translated to 0.77 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 3% of all program expenses.

### 9.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 9.1**.

#### LADWP Funding

In FY 2016-17, a total of $18,725,770 in LADWP funding was expended on RLEP. Funds were spent on a mix of LAWDP labor, overhead costs, materials (i.e., LEDs), and services provided by external vendors (i.e., AM Conservation Group). See **Appendix 9.1** for a summary of how these program funds were spent according to different cost categories.

### Co-investment

RLEP does not require any matching funds from benefiting households or building owners. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that RLEP saved a total of 48,382,070 kilowatt hours (kWh) in FY 2016-17. Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came out to $7,644,367. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by RLEP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Spending on materials went towards the cost of manufacturing LEDs, which were modeled in IMPLAN as semiconductor and related device manufacturing. This industrial sector is consistent with how LED manufacturing is classified according to the North American Industry Classification System (NAICS).

The program funds that went to AM Conservation Group were modeled in IMPLAN as a mix of industries, as based on the itemized expenses reported by the vendor for each residential lighting kit. The majority of these funds were spent on purchasing LEDs (modeled as semiconductor and related device manufacturing. Delivering the lighting kits was the second greatest expense). This activity was performed by AM Conservation Group and was modeled as management consulting services because that industry represents AM Conservation Group's primary set of business activities. The remaining funds were spent on reusable tote bags (modeled as textile bags and canvas mills) and marketing materials (modeled as printing). See **Appendix 9.1** for a summary of how LADWP spending on AM Conservation Group was modeled in IMPLAN.

Since RLEP benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words,

an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[85]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

All of the LEDs and canvas bags were purchased directly from the manufacturer. Thus, pricing margins were not applied to spending on semiconductor and related device manufacturing and textile bags and canvas mills.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, pricing margins were not applicable for modeling an increase in household income. Moreover, management consulting, printing, and postal services are not purchased through third-party retailers, so pricing margins were not applicable for these industrial sectors in IMPLAN.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all RLEP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area.

According to LADWP staff, all of the LEDs and reusable bags were manufactured in China, so the local purchase rate for semiconductor and related device manufacturing and textile bags and canvas mills was modeled as zero. Similarly, all of the distribution services were performed

[85] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of RLEP customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

by AM Conservation Group in partnership with a subcontractor (Power District), neither of which is located in Los Angeles County, so the local purchase rate for management consulting services was also modeled as zero.

RLEP requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for the customers who benefit from the program.

# 10. Energy Savings Assistance Program (ESAP)

**Program Type:** Residential Mass Market

**Intervention Type**: Lighting, Water Conservation, Building Envelope Weatherization

**Budget in FY 2016-17:** $577,000

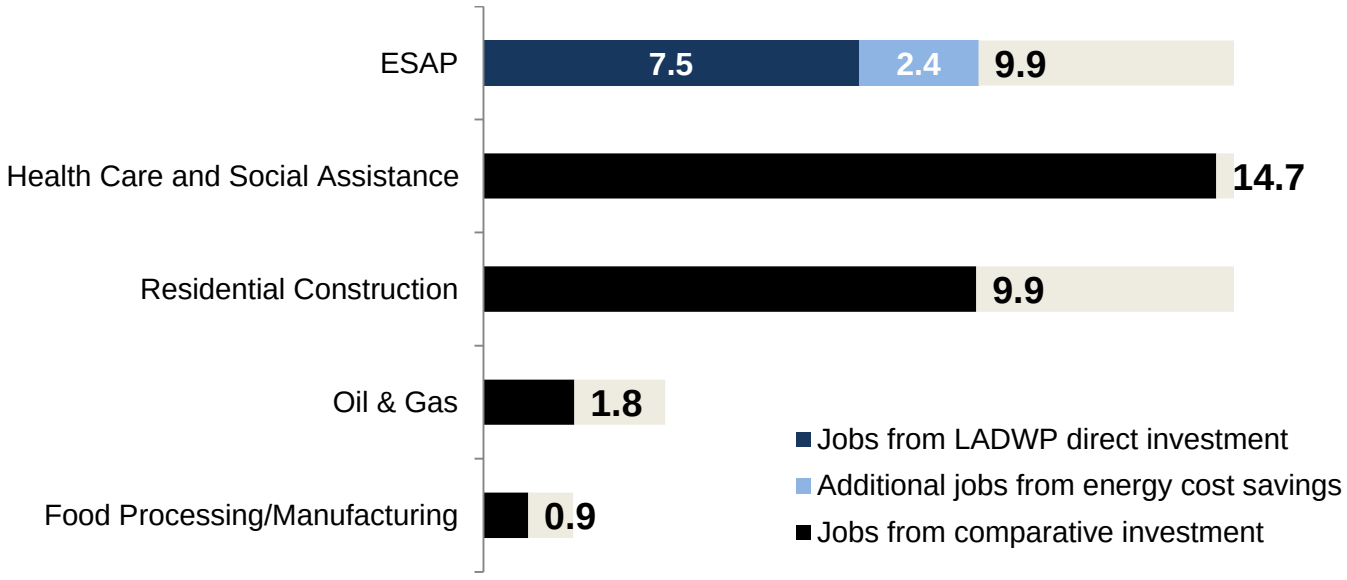
**Estimated Energy Cost Savings:** $204,543

**Employment Benefits:** 5.7 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $686,321 in Los Angeles County

**Labor Income:** $456,550 in Los Angeles County

**Jobs from ESAP vs. Benchmark Industries[86]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[86] No energy cost savings were assumed for benchmark industries.

## 10.1 Program Description

The Energy Savings Assistance Program (ESAP) targets income qualifying residents living in multi-family housing, providing no-cost energy and water saving measures for residents with an income under 200% of the Federal Poverty Guideline. ESAP offers weatherization measures and efficiency upgrades for individual residential units. The measures include weather stripping, caulking, low-flow showerheads, water heater blankets, and door and building envelope repairs that reduce air infiltration. In addition, LADWP funds the delivery of electric energy saving products including light-emitting diode (LED) bulbs, smart power strips, LED night lights, and energy efficient torchiere lamps through ESAP.

LADWP has partnered with the Southern California Gas Company (SoCalGas) to jointly implement a group of efficiency programs in order to provide more comprehensive services to customers and save on overall program costs. SoCalGas leads the implementation, management, and administration of ESAP, including contracting of third-party service providers. LADWP reports energy and water savings and provides reimbursement to SoCalGas for a portion of program costs, including the implemented electricity and water saving measures.

## 10.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in ESAP during fiscal year (FY) 2016-17, totaling $577,000, is supporting **4.3** full-time equivalent (FTE) job-years in Los Angeles County (or 7.5 FTE job-years per million dollars of LADWP investment). The program also saved low-income residential ratepayers$204,543 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **1.4** FTE job-years (or 2.4 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **5.7** FTE-jobs years in Los Angeles County (or 9.9 FTE job-years per million dollars of LADWP investment). See **Table 10.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[87]

**Table 10.1 Direct, Indirect, and Induced Jobs Supported by ESAP[88]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($577,000) | 2.9 | 1.1 | 0.3 | **4.3** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($204,543) | - | - | 1.4 | **1.4** |
| **Total** | **2.6** | **1.1** | **1.7** | **5.7** |

[87] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[88] Disaggregated numbers may not add up to totals due to rounding.

## 10.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from ESAP, including value added and labor income. We estimate that LADWP's investment in ESAP during FY 2016-17 added a total of **$0.7** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 67% of the total value added. See **Tables 10.2** and **10.3** for a summary of the direct, indirect, and induced impacts of ESAP on value added and labor income, respectively, in Los Angeles County.[89]

**Table 10.2 Value Added by ESAP[90]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,999,942) | $264,494 | $158,713 | $111,831 | **$535,038** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($204,543) | - | - | $151,283 | **$151,283** |
| **Total** | **$264,494** | **$158,713** | **$263,114** | **$686,321** |

**Table 10.3 Labor Income from ESAP[91]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,999,942) | $219,169 | $89,262 | $63,183 | **$371,614** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($204,543) | - | - | $84,936 | **$84,936** |
| **Total** | **$219,169** | **$89,262** | **$148,119** | **$456,550** |

[89] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[90] Disaggregated numbers may not add up to totals due to rounding.
[91] See footnote above.

## 10.4 Methodology

In order to estimate the employment and economic benefits of ESAP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 10.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 6% of the total jobs, 10% of the total value added, and 15% of the total labor income reported for ESAP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 10.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to ESAP by LADWP employees (including regular and overtime) translated to 0.03 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 2% of all program expenses.

#### SoCalGas Employees

LADWP implements the program in collaboration with SoCalGas. In FY 2016-17, the hours billed by SoCalGas translated to 0.31 FTEs. During the same period, direct spending on SoCalGas employee compensation totaled 10% of all program expenses.

### 10.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 10.1**.

### LADWP Funding

In FY 2016-17, a total of $577,000 in LADWP funding was expended on ESAP. Funds were spent on a mix of LADWP labor, SoCalGas labor, overhead costs, and services provided by external vendors (i.e., energy efficiency assessments, efficiency upgrades, and printing services). See **Appendix 10.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

ESAP is designed to serve low-income customers and does not require any matching funds from benefiting households or building owners. Thus, no co-investment was modeled for ESAP.

### Energy Cost Savings

LADWP estimates that ESAP saved a total of 1,798,202 kilowatt hours (kWh) in FY 2016-17. Savings are calculated based on a formula of annual estimated savings of the measures installed and the expected operating hours of these measures.

A couple of key assumptions had to be made for modeling energy cost savings. First, it is assumed that all ESAP participants are enrolled in one of the discount rate programs for residential customers because the program is designed to serve low-income households. In reality, some ESAP participants may not be taking advantage of these discount rates, thus paying the standard residential rate. Assessing the actual rates that ESAP participants pay was outside of the scope of this study. Assuming that all ESAP customers are on a discount rate is also a conservative assumption because it translates to less overall energy cost savings for residential customers. Second, the mix of discount rates among ESAP participants was assumed to mirror that of the entire LADWP customer base receiving a discount (see **Appendix 2.2** for the mix of discount rates that were modeled).

Two customer rates were ultimately used to model ESAP's overall energy cost savings. An average per kilowatt cost of $ 0.119 was assumed for customers with the low-income discount rate and $0.106 was assumed for customers with all other discount rates. The $0.119 energy cost came from a LADWP energy sales report that took a moving average of total kilowatt hours consumed by residential customers with the low-income discount rate and divided it by total revenue from these customers. The same method was used to obtain the $0.106 energy cost for customers on all other discount rates. These are all-inclusive numbers, accounting for taxes, fees, and other related costs that customers are billed for electricity usage. In total, the energy cost savings modeled for ESAP for came to $204,543.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by ESAP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Program funds spent on outside services were spent in three ways. Most of these funds went to subcontractors (The East Los Angeles Community Union, the Maravilla Foundation, and Reliable Energy Management, Inc.), to assess properties and perform energy efficiency measures. These program funds were modeled as maintenance and repair construction of residential structures in IMPLAN, an industry code that includes built-in assumptions about contractor spending on materials and labor. SoCalGas also billed LADWP for direct implementation services (e.g., program management, monitoring, reporting, etc.), which were modeled as an increase in employee compensation in order to capture the induced impacts of payroll costs (direct benefits were captured from primary data). Lastly, a small share of the funds that went to SoCalGas were spent on printing work order forms, which were modeled in IMPLAN as spending on printing services.

Since ESAP benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[92]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

[92] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of ESAP customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.3** for a summary of these assumptions.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, pricing margins were not applicable for modeling an increase in household income. Moreover, construction and printing services are not purchased through a third-party retailer, so pricing margins were not applicable for these economic sectors in IMPLAN.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all ESAP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. In contrast, a local purchase rate of 25.64% was applied to employee compensation for SoCalGas employees, which accounts for the place of residence, hourly wage, and hours worked of each SoCalGas employee billing ESAP.

All three subcontractors are based in Los Angeles County, so a 100% local purchase rate was applied to spending on maintenance and repair construction of residential structures. Detailed information was not available about printing expenses, so the default local purchase rate was assumed for spending in this sector (17.82%).

ESAP requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for the customers who benefit from the program.

# 11. Home Upgrade Energy Upgrade California (HU EUC) Program

**Program Type:** Residential Mass Market

**Intervention Type**: Building Envelope Weatherization, Water Conservation, Gas Conservation, Heating/Air Conditioning, Roof, Pool Pump

**Budget in FY 2016-17:** $956,937

**Estimated Co-investment:** $6,623,318

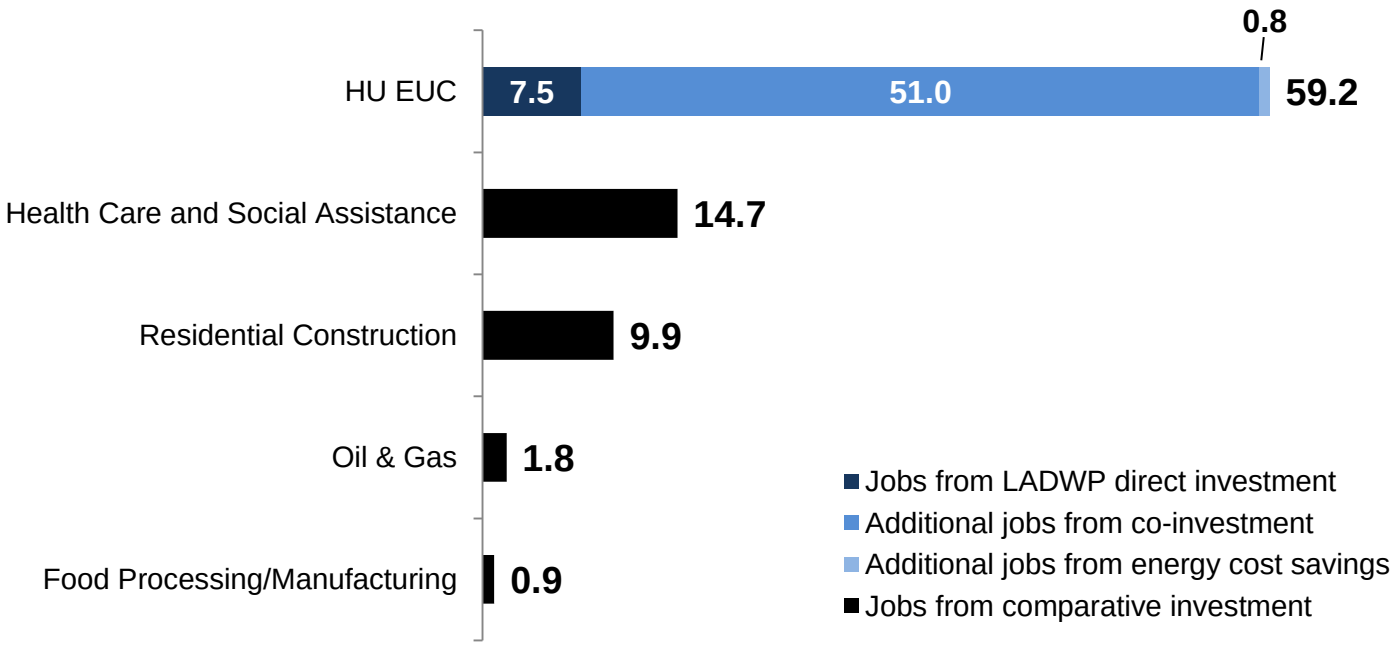
**Estimated Energy Cost Savings:** $123,611

**Employment Benefits:** 56.7 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $5,102,050 in Los Angeles County

**Labor Income:** $3,336,674 in Los Angeles County

**Jobs from HU EUC vs. Benchmark Industries[93]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[93] No energy cost savings were assumed for benchmark industries.

## 11.1 Program Description

The Home Upgrade Energy Upgrade California (HU EUC) Program is a collaborative effort among California counties, cities, nonprofit organizations, the state's investor-owned utilities (IOUs), and publicly-owned utilities to deliver a California statewide "whole house" residential retrofit energy efficiency program. In Los Angeles, the program is jointly administered by LADWP and the Southern California Gas Company (SoCalGas).

HU EUC offers incentives to homeowners who complete selected energy-saving home improvements on single-family residences. These incentive packages encourage customers to take a "whole house" approach by combining several related improvements at once to increase a home's overall energy efficiency and to achieve greater energy savings.

Homeowners can choose from two incentive options, the Home Upgrade Package or Advanced Home Upgrade Package, depending on their improvement needs and budget. The Home Upgrade Package offers a rebate of up to $3,000 for homeowners who work with a participating contractor to install specific energy-saving measures in their home. Each measure earns points toward incentives; a minimum of 100 points and three measures are required. The Advanced Home Upgrade Package includes all of the measures in the Home Upgrade Package and offers rebates of up to $5,500 for homeowners who work with a participating contractor to install a minimum of three measures total to meet a minimum modeled energy savings of 10%.

## 11.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in HU EUC during fiscal year (FY) 2016-17, totaling $956,938, is supporting **7.1** full-time equivalent (FTE) job-years in Los Angeles County (or 7.5 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, we estimate that consumers co-invested $6,623,318, supporting **48.8** FTE job-years (or 51 job-years per million dollars of LADWP investment).The program also saved residential ratepayers $123,611 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **0.7** FTE job-years (or 0.8 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **56.7** FTE-jobs years in Los Angeles County (or 59.2 job-years per million dollars of LADWP investment). See **Table 11.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[94]

[94] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.

**Table 11.1 Direct, Indirect, and Induced Jobs Supported by HU EUC[95]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($956,938) | 3.7 | 2.0 | 1.4 | **7.1** |
| Co-investment ($6,623,318) | 24.9 | 14.9 | 9.1 | **48.8** |
| Energy Cost Savings ($123,611) | - | - | 0.7 | **0.7** |
| **Total** | **28.6** | **16.9** | **11.2** | **56.7** |

## 11.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from HU EUC, including value added and labor income. We estimate that LADWP's investment in HU EUC during FY 2016-17 added a total of **$5.1** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 65% of the total value added. See **Tables 11.2** and **11.3** for a summary of the direct, indirect, and induced impacts of HU EUC on value added and labor income, respectively, in Los Angeles County.[96]

**Table 11.2 Value Added by HU EUC[97]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($956,938) | $302,660 | $208,864 | $151,331 | **$662,855** |
| Co-investment ($6,623,318) | $1,882,650 | $1,513,429 | $964,849 | **$4,360,928** |
| Energy Cost Savings ($123,611) | - | - | $78,267 | **$78,267** |
| **Total** | **$2,185,310** | **$1,722,293** | **$1,194,447** | **$5,102,050** |

**Table 11.3 Labor Income from HU EUC[98]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($956,938) | $243,017 | $117,465 | $85,499 | **$445,981** |
| Co-investment ($6,623,318) | $1,450,479 | $851,150 | $545,158 | **$2,846,787** |
| Energy Cost Savings ($123,611) | - | - | $43,906 | **$43,906** |
| **Total** | **$1,693,496** | **$968,615** | **$674,563** | **$3,336,674** |

[95] Disaggregated numbers may not add up to totals due to rounding.
[96] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[97] Disaggregated numbers may not add up to totals due to rounding.
[98] See footnote above.

## 11.4 Methodology

In order to estimate the employment and economic benefits of HU EUC, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review the **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 11.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 0.4% of the total jobs, 0.8% of the total value added, and 1.3% of the total labor income reported for HU EUC in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 11.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to HU EUC by LADWP employees (including regular and overtime) translated to 0.07 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 2.3% of all program expenses.

#### SoCalGas Employees

LADWP implements the program in collaboration with SoCalGas. In FY 2016-17, the hours billed by SoCalGas translated to 0.14 FTEs. During the same period, direct spending on SoCalGas employee compensation totaled 2.2% of all program expenses.

### 11.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 11.1**.

### LADWP Funding

In FY 2016-17, a total of $3,845,587 in LADWP funding was expended on HU EUC. Funds were spent on a mix of LADWP labor, SoCalGas labor, overhead costs, and incentives. See **Appendix 11.1** for a summary of how these program funds were spent according to different cost categories.

### Co-investment

HU EUC is designed to compensate homeowners for the incremental costs they incur when conducting "whole house" energy efficiency retrofits rather than single-measure upgrades. Based on a sample of 1,969 projects completed through June 2018, LADWP reported that the average total cost of a project was $18,934, with an average rebate amount of $3,316 (65% of which is paid by LADWP and 35% of which is paid by SoCalGas). Based on the observed ratio between LADWP's incentive contribution and consumer co-investment (1 to 7.25), and the total amount of funding that LADWP spent on incentives in FY 2016-17 ($914,067), it is projected that consumers co-invested $6,623,318 towards the HU EUC Program.

### Energy Cost Savings

LADWP estimates that HU EUC saved a total of 782,350 kilowatt hours (kWh) in FY 2016-17. Aggregated savings are based on the energy savings of each measure installed through this program and the resulting savings achieved in each residence.

Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came out to $123,611. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by HU EUC, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

The majority of program funds were distributed as customer incentives to homeowners for energy efficiency retrofits. These program funds were modeled as maintenance and repair construction of residential structures in IMPLAN, an industry code that includes built-in

assumptions about contractor spending on materials and labor. Customer co-investment was modeled as spending within this same industry.

SoCalGas also billed LADWP for direct implementation services (e.g., program management, monitoring, and coordination with statewide partners, etc.). These expenses were modeled as an increase in employee compensation in order to capture their induced impacts (direct benefits were captured from primary data).

Since HU EUC benefits residential customers, energy cost savings were modeled as an increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[99]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that all program funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, pricing margins were not applicable for modeling an increase in household income. Moreover, construction services are not purchased through a third-party retailer, so pricing margins were not applicable for this economic sector in IMPLAN.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

[99] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of HU EUC customers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all HU EUC staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. Similarly, all SoCalGas employees who work on HU EUC live in Los Angeles County, so a 100% local purchase rate was applied to spending on compensation for SoCalGas employees.

Detailed information was not available on the locations of contractors that installed energy efficiency upgrades through HU EUC. Some of these contractors may be located outside of Los Angeles County, while still performing work in Los Angeles County, so the default local purchase rate (73%) was assumed for spending on maintenance and repair construction.

HU EUC requires that all efficiency upgrades occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income (vis-à-vis energy cost savings) for homeowners who benefit from the program.

# 12. Commercial Lighting Incentive Program (CLIP)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Lighting

**Budget in FY 2016-17:** $8,159,637

**Estimated Co-investment:** $1,013,895

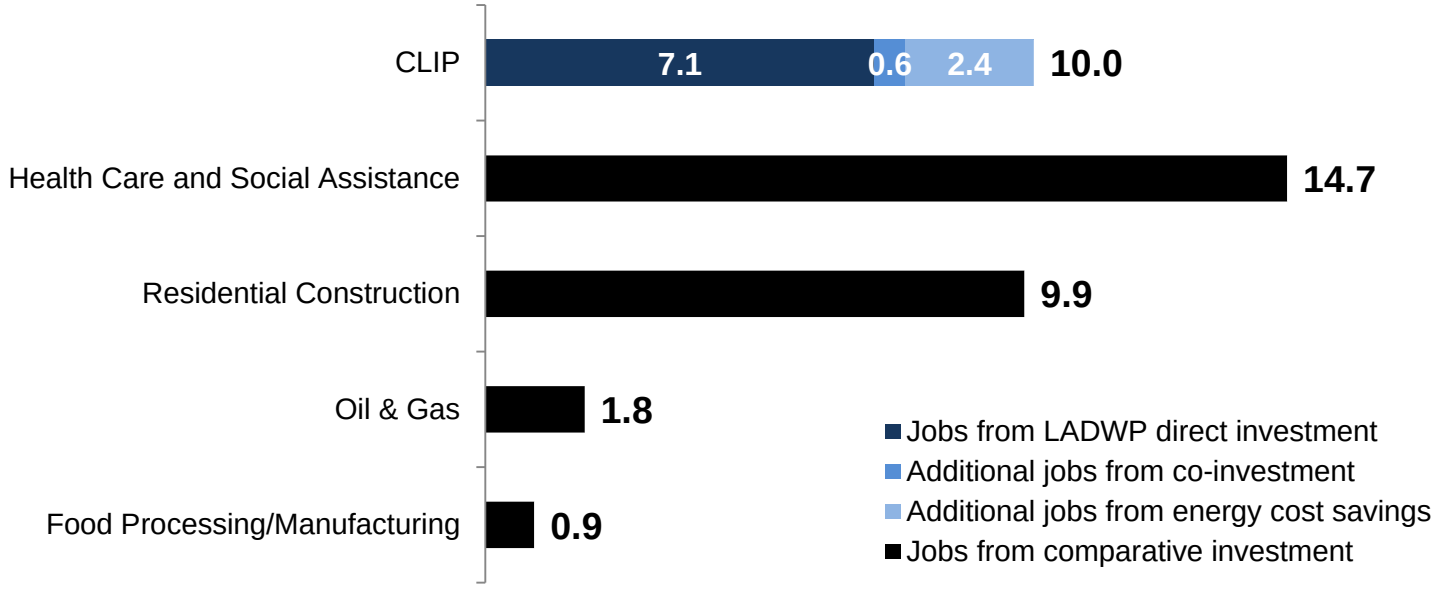
**Estimated Energy Cost Savings:** $4,855,496

**Employment Benefits:** 82 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $10,570,679 in Los Angeles County

**Labor Income:** $8,241,888 in Los Angeles County

**Jobs from CLIP vs. Benchmark Industries[100]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[100] No co-investment energy cost savings were assumed for benchmark industries.

## 12.1 Program Description

The Commercial Lighting Incentive Program (CLIP) offers incentives to help make a wide variety of high-performance lamps and lighting fixtures cost-effective, and targets any size business that still utilizes standard fixtures. CLIP is designed to leverage established contractor networks to offer non-residential customers a full suite of incentives for qualifying lighting products and services to improve the energy efficiency in their businesses by upgrading/retrofitting core lighting systems.

Lighting programs have historically been among the most popular, robust commercial rebate programs in the LADWP portfolio. CLIP offers rebates for a wide variety of high-performance lamps and lighting fixtures. With the incentive, businesses can realize short payback periods of 24 months or less for lighting upgrades.

## 12.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in CLIP during fiscal year (FY) 2016-17, totaling $8,159,637, is supporting **58.2** full-time equivalent (FTE) job-years in Los Angeles County (or 7.1 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, we estimate that consumers co-invested $1,013,895, supporting **4.5** FTE job-years (or 0.6 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $4,855,496 million in estimated energy costs, which is ultimately reinvested back into the economy, supporting **19.3** FTE job-years (or 2.4 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **82** FTE job-years in Los Angeles County (or 10 job-years per million dollars of LADWP investment). See **Table 12.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[101]

**Table 12.1 Direct, Indirect, and Induced Jobs Supported by CLIP[102]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,159,637) | 31.4 | 5.5 | 21.3 | **58.2** |
| Co-investment ($1,013,895) | 3.6 | 0.4 | 0.5 | **4.5** |
| Energy Cost Savings ($4,855,496) | - | - | 19.3 | **19.3** |
| **Total** | **35.0** | **5.6** | **41.1** | **82.0** |

[101] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[102] Disaggregated numbers may not add up to totals due to rounding.

## 12.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from CLIP, including value added and labor income. We estimate that LADWP's investment in CLIP during FY 2016-17 added a total of **$10.6** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 78% of the total value added. See **Tables 12.2** and **12.3** for a summary of the direct, indirect, and induced impacts of CLIP on value added and labor income, respectively, in Los Angeles County.[103]

**Table 12.2 Value Added by CLIP[104]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,159,637) | $5,032,126 | $623,150 | $2,262,977 | **$7,918,253** |
| Co-investment ($1,013,895) | $342,945 | $117,331 | $154,515 | **$614,791** |
| Energy Cost Savings ($4,855,496) | - | - | $2,037,634 | **$2,037,634** |
| **Total** | **$5,375,071** | **$740,481** | **$4,455,126** | **$10,570,679** |

**Table 12.3 Labor Income from CLIP[105]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,159,637) | $5,001,356 | $353,424 | $1,278,060 | **$6,632,840** |
| Co-investment ($1,013,895) | $301,628 | $66,594 | $87,284 | **$455,506** |
| Energy Cost Savings ($4,855,496) | - | - | $1,153,541 | **$1,153,541** |
| **Total** | **$5,302,984** | **$420,018** | **$2,518,885** | **$8,241,888** |

[103] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[104] Disaggregated numbers may not add up to totals due to rounding.
[105] See footnote above.

## 12.4 Methodology

In order to estimate the employment and economic benefits of CLIP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 12.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 16% of the total jobs, 33% of the total value added, and 42% of the total labor income reported for CLIP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 12.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to CLIP (including regular and overtime) translated to 13 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 42% of all program expenses.

### 12.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 12.1**.

#### LADWP Funding

In FY 2016-17, a total of $8,159,637 in LADWP funding was expended on CLIP. Funds were spent on a mix of LADWP labor, overhead costs, incentives, and services provided by external vendors. See **Appendix 12.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

In some cases, the incentives offered through CLIP do not completely offset the cost of the lighting installation. In these cases, the participating business must pay the difference between the financial incentive and the full cost of the project. CLIP participants, therefore, are considered co-investors (with LADWP) in the installation of energy efficient lighting in commercial settings. Based on a random sample of 32 invoices in FY 2016-17, there were eight projects in which a remaining balance was passed onto the participating business. The co-investment from these eight projects accounted for 17.9% of total installation costs for the entire sample. Assuming that the observed ratio between LADWP incentives and co-investment (1 to 0.22) from the sample is representative of all projects in FY 2016-17, it is projected that the full $4,652,566 in LADWP funding for financial incentives generated $1,013,895 in co-investment.

### Energy Cost Savings

LADWP estimates that CLIP saved a total of 31,735,271 kilowatt hours (kWh) in FY 2016-17. Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $4,855,497. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CLIP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead, were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

LADWP spending on incentives was modeled in IMPLAN as a mix of industries, as based on the itemized expenses from the sample of invoices. The majority of these funds was spent on the light-emitting diodes (LEDs), which were modeled in IMPLAN as semiconductor and related device manufacturing. This industrial sector is consistent with how LED manufacturing is classified according to the North American Industry Classification System (NAICS). The remaining funds were spent on installation activities (modeled in IMPLAN as maintenance and repair construction of nonresidential structures), engineering activities (modeled as architecture, engineering, and related services), recycling fees (modeled as waste management and remediation services), equipment rentals (modeled as commercial and industrial machinery and equipment rental and leasing), shipping and handling (modeled as US Postal Service), and

other material expenses (modeled as a mix of manufacturing sectors). See **Appendix 12.1** for a summary of how LADWP spending on incentives was modeled in IMPLAN.

Spending on outside services went to membership and consultant services used to promote efficiency programs, such as the Consortium for Energy Efficiency and the Los Angeles Better Buildings Challenge. These expenses were modeled in IMPLAN as management consulting services because this industrial sector represents organizations that provide operating advice and assistance to businesses and other organizations on marketing issues, such as developing marketing objectives and policies, sales forecasting, new product developing and pricing, licensing and franchise planning, and marketing planning and strategy.

Co-investment was also modeled as spending in a variety of industries. The mix of industries assigned to co-investment was based on the subsample of invoices in which there was a remaining balance for the customer. Thus, the mix of industries impacted by co-investment is slightly different than the mix of industries impacted by LADWP spending on incentives. See **Appendix 12.1** for a summary of how co-investment was modeled in IMPLAN.

Energy cost savings were modeled as an increase in proprietor income in IMPLAN, which averages together the many ways in which a self-employed individual may spend an increase in income, including both savings and the purchase of goods and services. In other words, it is assumed that energy cost savings translate to increased profits for business owners.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that all LADWP funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it is assumed that contractors are purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all manufacturing sectors (i.e., semiconductor and related device manufacturing; power, distribution, and specialty transformer manufacturing; and electric lamp bulb and part manufacturing).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for

modeling an increase in proprietor income and all service related sectors (e.g., maintenance and repair construction of nonresidential structures; architecture, engineering, and related services; waste management and remediation services; management consulting services; etc.).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all CLIP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area.

All materials purchased by CLIP contractors are assumed to be purchased through local retailers. Thus, a 100% local purchase rate was applied to the retail stage of the supply chain for all impacted manufacturing sectors. However, IMPLAN's default local purchase rates were applied to the manufacturing stage along each manufacturing sector's supply chain. These percentages are particularly low (ranging between 3% and 7%) because the impacted manufacturing sectors are not concentrated in Los Angeles County.

IMPLAN's default local purchase rates were applied to LADWP funds and co-investment spent on installation labor and other services that were detailed in the sample of invoices (architecture, engineering, and related services; waste management and remediation services; commercial and industrial machinery and equipment; rental and leasing; etc.). Similarly, the default local purchase rate was applied to LADWP spending on consulting services. Validating IMPLAN's built-in local purchase rates against actual sourcing information was outside the scope of this study.

All CLIP incentives must be applied towards projects located within the LADWP service area. It is assumed that all energy cost savings benefit local business owners. Thus, a 100% local purchase rate was modeled for the increase in proprietor income.

# 13. Commercial Performance Program (CPP)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Lighting, Heating/Air Conditioning, Windows, Equipment Controls

**Budget in FY 2016-17:** $8,334,517

**Estimated Co-investment:** $1,851,321

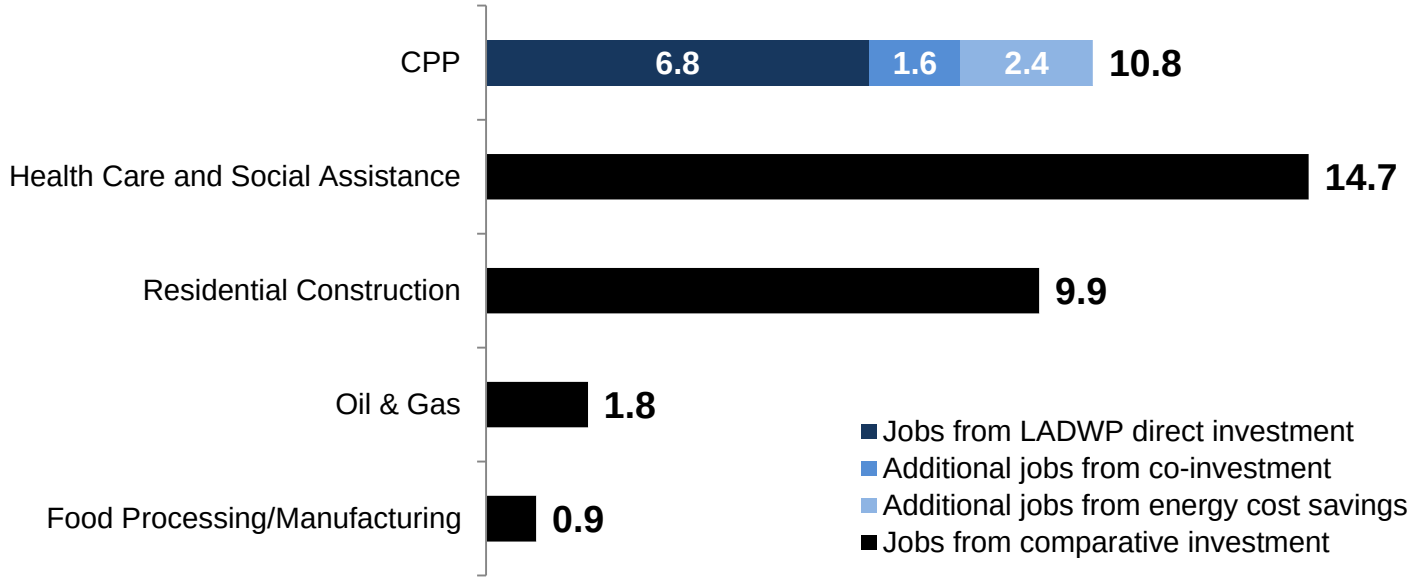
**Estimated Energy Cost Savings:** $4,969,891

**Employment Benefits:** 90.3 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $10,728,392

**Labor Income:** $8,501,675

**Jobs from CPP vs. Benchmark Industries[106]**
**(FTE Job-Years in Los Angeles County per Million of Direct Investment)**




[106] No co-investment energy cost savings were assumed for benchmark industries.

## 13.1 Program Description

The Custom Performance Program (CPP) offers cash incentives for energy saving measures not covered by existing prescriptive programs and other innovative energy saving strategies that exceed California Title 24 Building Energy Efficiency Standards or industry standards. Eligible measures include: retro-commissioning (RCx); heating, ventilation, and air conditioning- (HVAC) refrigeration; thermal energy storage; lighting; industrial processes; building envelope; plug load occupancy sensors; network personal computer (PC) power management software; and high efficiency copiers among others.

Incentives for each project are paid per kilowatt-hour based on energy savings calculated or accepted by LADWP. Program managers and energy efficiency engineers evaluate the benefits and merits of each of the energy saving measures using standardized tools and reviewing information provided by the customer to determine appropriate cash incentives for participating customers based on the program guidelines.

## 13.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in CPP during fiscal year (FY) 2016-17, totaling $8,334,517, is supporting **57.1** full-time equivalent (FTE) job-years in Los Angeles County (or 6.8 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, we estimate that businesses co-invested $1,851,321, supporting **13.6** FTE job-years (or 1.6 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $4,969,891 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **19.7** FTE job-years (or 2.4 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **90.3** FTE-jobs years in Los Angeles County (or 10.8 FTE job-years per million dollars of LADWP investment). See **Table 13.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[107]

**Table 13.1 Direct, Indirect, and Induced Jobs Supported by CPP[108]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,334,517) | 34.9 | 6.4 | 15.8 | **57.1** |
| Co-investment ($1,851,321) | 8.1 | 2.1 | 3.3 | **13.6** |
| Energy Cost Savings ($4,969,891) | - | - | 19.7 | **19.7** |
| **Total** | **43.0** | **8.5** | **38.8** | **90.3** |

[107] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[108] Disaggregated numbers may not add up to totals due to rounding.

## 13.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from CPP, including value added and labor income. We estimate that LADWP's investment in CPP during FY 2016-17 added a total of **$10.7** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 79% of the total value added. See **Tables 13.2** and **13.3** for a summary of the direct, indirect, and induced impacts of CPP on value added and labor income, respectively, in Los Angeles County.[109]

**Table 13.2 Value Added by CPP[110]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,334,517) | $4,900,903 | $746,862 | $1,679,275 | **$7,327,040** |
| Co-investment ($1,851,321) | $710,598 | $248,733 | $356,381 | **$1,315,712** |
| Energy Cost Savings ($4,969,891) | - | - | $2,085,641 | **$2,085,641** |
| **Total** | **$5,611,501** | **$995,595** | **$4,121,296** | **$10,728,392** |

**Table 13.3 Labor Income from CPP[111]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($8,334,517) | $4,901,695 | $420,352 | $948,465 | **$6,270,513** |
| Co-investment ($1,851,321) | $709,153 | $139,983 | $201,307 | **$1,050,444** |
| Energy Cost Savings ($4,969,891) | - | - | $1,180,719 | **$1,180,719** |
| **Total** | **$5,610,848** | **$560,335** | **$2,330,491** | **$8,501,675** |

[109] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[110] Disaggregated numbers may not add up to totals due to rounding.
[111] See footnote above.

## 13.4 Methodology

In order to estimate the employment and economic benefits of CPP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data was used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 13.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 12% of the total jobs, 26% of the total value added, and 33% of the total labor income reported for CPP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 13.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to CPP by LADWP employees (including regular and overtime) translated to 9.2 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 29% of all program expenses.

#### Engineering Support Services

LADWP contracts with the Southern California Gas Company (SoCalGas) to provide engineering support services for this program. SoCalGas in turn utilizes the services of three subcontractors to help LADWP review project documents and verify energy savings. The subcontracting firms are kW Engineering, Lincus Energy, and TRC. In FY 2016-17, the hours billed by SoCalGas and the three subcontractors corresponded to a total of 1.6 FTEs. During the same period, direct spending on contractor and subcontractor compensation totaled 5% of all program expenses.

### 13.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending

timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information as it pertains to CPP, see **Appendix 13.1**.

### LADWP Funding

In FY 2016-17, a total of $8,332,934 in LADWP funding was expended on CPP. Funds were spent on a mix of LADWP labor, overhead costs, incentives, and engineering support services. See **Appendix 13.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

In most cases, the incentives offered through CPP do not completely offset the cost of the efficiency measure. Incentive levels are capped at 75% of the total project cost. Participating business must pay the difference between the financial incentive and the full cost of the project. CPP participants, therefore, are considered co-investors (with LADWP) in the installation of energy efficiency upgrades in commercial settings.

Without detailed information on the co-investment levels for each project, a conservative assumption was applied to calculating the co-investment for this program, such that participating businesses provided the minimum match possible (25% of total project costs). In FY 2016-17, incentives totaled $5,553,962, suggesting that project costs totaled at least $7,405,283, and that co-investment totaled at least $1,851,321.

### Energy Cost Savings

LADWP estimates that CPP saved a total of 32,482,948 kilowatt hours (kWh) in FY 2016-17. Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $4,969,891. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CPP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. Likewise, program funds that went towards engineering support services (i.e., SoCalGas, kW Engineering, Lincus Energy, and TRC) were modeled as an increase in employee compensation because these funds are assumed to be primarily spent on payroll. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers

spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

LADWP spending on incentives was modeled in IMPLAN as a mix of industries, based on a sample of invoices provided by LADWP. The majority of these funds were spent on HVAC frequency drives, thermostats, and other control devices, all of which were modeled in IMPLAN as automatic environmental control manufacturing. The remaining funds were spent on installation activities (modeled as maintenance and repair construction of nonresidential structures), miscellaneous materials and hardware (modeled as retail stores - building material and garden supply), and freight services (modeled as US Postal Service). See **Appendix 13.1** for a summary of how LADWP spending on incentives was modeled in IMPLAN.

Co-investment was modeled according to the same mix of industries as LADWP spending on incentives. In other words, it is assumed that LADWP's incentives and co-investment are applied towards the entire cost of a given project, rather than towards a specific expense within the project's budget.

Energy cost savings were modeled as an increase in proprietor income in IMPLAN, which averages together the many ways in which a self-employed individual may spend an increase in income, including both savings and the purchase of goods and services. In other words, it is assumed that energy cost savings translate to increased profits for business owners.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that all LADWP funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it is assumed that contractors are purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to automatic environmental control manufacturing in the model.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in proprietor income and all service related sectors (e.g., maintenance and repair construction of nonresidential structures and the US Postal Service).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 46% local purchase rate, a percentage that accounts for the place of residence, billing rate, and hours worked for each staff member billing to the program. In other words, around 46% of spending on LADWP employee compensation went to residents of Los Angeles County.

Funds that went to SoCalGas, kW Engineering, Lincus Energy, and TRC for engineering support services were modeled with a local purchase rate of 87%. Again, this percentage accounts for the place of residence, rate, and hours worked of each employee billing to CPP.

Detailed information was not available on the locations of contractors that installed energy efficiency upgrades through CPP. Some of these contractors may be located outside of Los Angeles County, while still performing work in Los Angeles County, so the default local purchase rate was assumed for spending on maintenance and repair construction of nonresidential buildings (75.14%).

IMPLAN's default local purchase rates were applied to consumer spending on HVAC frequency drives, thermostats, and other control devices (modeled as automatic environmental control manufacturing in IMPLAN). The default local purchase rate at the retail stage of the supply chain was 99% for the impacted sector. However, the local purchase rate at the manufacturing stage was much lower (less than 1%) because automatic environmental control manufacturing is not concentrated in Los Angeles County.

The default local purchase rate was also assumed for miscellaneous material expenditures. Thus, a local purchase rate of 80% was applied to retail - building material and garden supply. This industrial sector is used when the exact type of materials is unknown. When modeled in IMPLAN, this sector captures the employment and economic impacts of the retail activities associated with selling building and garden materials, but not the manufacturing impacts.

All CPP incentives must be applied towards projects located within the LADWP service area. It is assumed that all energy cost savings benefit local business owners. Thus, a 100% local purchase rate was modeled for the increase in proprietor income.

# 14. Savings by Design (SBD)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Building Envelope Weatherization, Lighting, Heating/Air Conditioning

**Budget in FY 2016-17:** $3,845,587

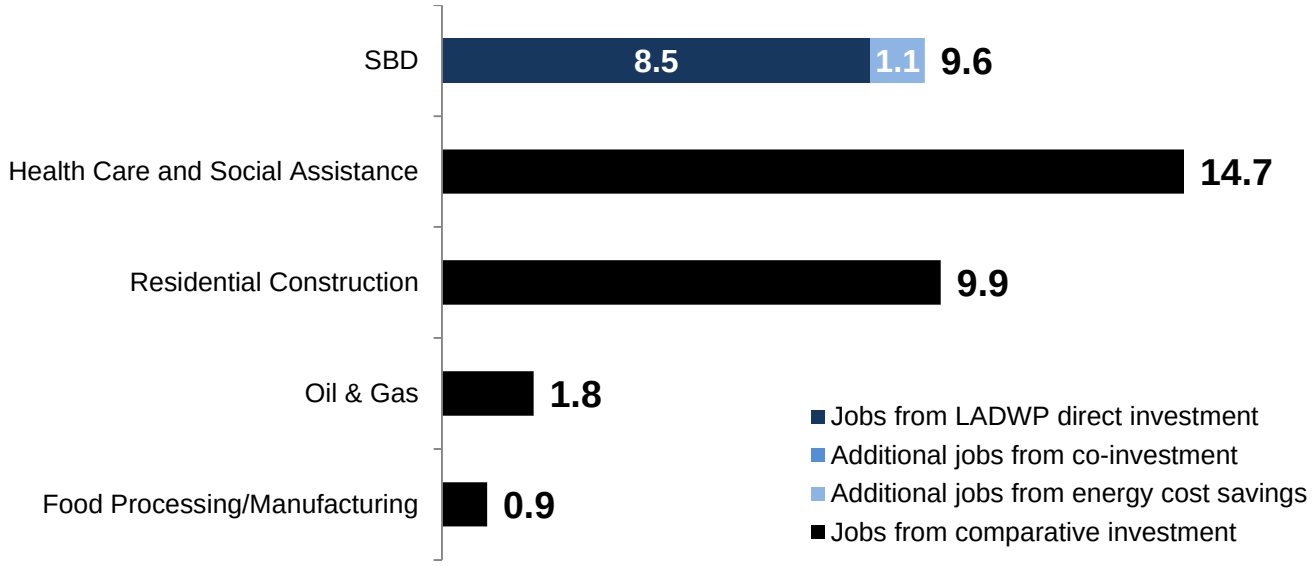
**Estimated Energy Cost Savings:** $1,038,018

**Employment Benefits:** 36.8 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $4,308,922 in Los Angeles County

**Labor Income:** $3,194,678 in Los Angeles County

**Jobs from SBD vs. Benchmark Industries[112]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[112] No energy cost savings were assumed for benchmark industries.

## 14.1 Program Description

Savings by Design (SBD) is California's non-residential new construction energy efficiency program, administered statewide and adopted by investor-owned utilities (IOUs) and a limited number of publicly-owned utilities (POUs). SBD encourages energy-efficient building design and construction practices, promoting the efficient use of energy by offering up-front design assistance supported by financial incentives based on project performance. Services begin in the project design phase and continue through construction completion. Design assistance can range from simple plan review and efficiency upgrade recommendations to computer simulation analysis comparing a number of alternative systems and integrated building design options.

SBD utilizes the California Building Energy Efficiency Standards (Title 24, Part 6) as a reference baseline for comparison. The program encourages projects to implement energy efficiency measures that go beyond those mandated by Title 24. Exceeding these standard energy performance levels requires a high level of design expertise, technical knowledge, and motivation. Because many in the design field are unaware of the potential savings from energy-efficient design or perceive budgetary constraints, they are reluctant to implement energy-efficiency strategies. As a result, energy efficiency is often a lost consideration, abandoned in favor of pursuing the "lower initial cost" or familiar option. SBD strives to avoid lost opportunities by assisting customers to move beyond initial cost considerations and towards realizing long-term energy cost savings.

## 14.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in SBD during fiscal year (FY) 2016-17, totaling $3,845,587, is supporting **32.7** full-time equivalent (FTE) job-years in Los Angeles County (or 8.5 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $1,038,018 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **4.1** FTE job-years (or 1.1 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **36.8** FTE-jobs years in Los Angeles County (or 9.6 FTE job-years per million dollars of LADWP investment). See **Table 14.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[113]

**Table 14.1 Direct, Indirect, and Induced Jobs Supported by SBD[114]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,845,587) | 21.6 | 2.3 | 8.7 | **32.7** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,038,018) | - | - | 4.1 | **4.1** |
| **Total** | **21.6** | **2.3** | **12.8** | **36.8** |

[113] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[114] Disaggregated numbers may not add up to totals due to rounding.

## 14.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from SBD, including value added and labor income. We estimate that LADWP's investment in SBD during FY 2016-17 added a total of **$4.3** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 74% of the total value added. See **Tables 14.2** and **14.3** for a summary of the direct, indirect, and induced impacts of SBD on value added and labor income, respectively, in Los Angeles County.[115]

**Table 14.2 Value Added by SBD[116]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,845,587) | $2,451,249 | $422,261 | $999,802 | **$3,873,312** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,038,018) | - | - | $435,610 | **$435,610** |
| **Total** | **$2,451,249** | **$422,261** | **$1,435,412** | **$4,308,922** |

**Table 14.3 Labor Income from SBD[117]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,845,587) | $2,124,488 | $258,885 | $564,699 | **$2,948,072** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,038,018) | - | - | $246,606 | **$246,606** |
| **Total** | **$2,124,488** | **$258,885** | **$811,305** | **$3,194,678** |

[115] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[116] Disaggregated numbers may not add up to totals due to rounding.
[117] See footnote above.

## 14.4 Methodology

In order to estimate the employment and economic benefits of SBD, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data was used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 14.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 8% of the total jobs, 26% of the total value added, and 33% of the total labor income reported for SBD in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 14.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed by LADWP employees to SBD (including regular and overtime) translated to 0.2 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 1.4% of all program expenses.

#### SoCalGas Employees

LADWP implements the program in collaboration with the Southern California Gas Company (SoCalGas). In FY 2016-17, the hours billed by SoCalGas translated to 0.4 FTEs. During the same period, direct spending on SoCalGas employee compensation totaled 1.6% of all program expenses.

#### Contractor Employees

Okapi Architecture, Inc. is the contractor for the SBD program and provides technical assistance and program management services. In FY 2016-17, the hours billed by Okapi translated to 2.6 FTEs. During the same period, direct spending on Okai employee compensation totaled 24.2% of all program expenses.

### 14.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent

also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 14.1**.

### LADWP Funding

In FY 2016-17, a total of $3,845,587 in LADWP funding was expended on SBD. Funds were spent on a mix of LADWP labor, SoCalGas labor, Okapi labor, overhead costs, and incentives. See **Appendix 14.1** for a summary of program spending according to cost category.

### Co-investment

SBD is designed to compensate contractors and developers for the additional cost they face when adopting energy efficiency measures that go beyond those required by Title 24. Without detailed project level cost data, it is assumed that the financial incentives offered by SBD largely offset those increased costs. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

Using Title 24 code as the baseline, Okapi employs state of the art energy modeling software to calculate the kilowatt hours (kWh) savings for each SBD project and reports this information monthly to LADWP. These calculations are subject to evaluation and verification by LADWP engineering staff. Based on these savings calculations LADWP estimates that SBD saved a total of 6,784,429 kWh in FY 2016-17.

Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $1,038,018. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and all other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by SBD, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. Similarly, program funds that went to SoCalGas and Okapi were modeled as an increase in employee compensation because these funds are assumed to be primarily spent on payroll. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Program funds spent on incentives were modeled as construction of new commercial structures in IMPLAN. This is industry was selected because incentive funding compensates contractors

and developers for the increased construction costs associated with adopting energy efficiency measures that go beyond those required by Title 24.

Energy cost savings were modeled as an increase in proprietor income in IMPLAN, which averages together the many ways in which a self-employed individual may spend an increase in income, including both savings and the purchase of goods and services. In other words, it is assumed that energy cost savings translate to increased profits for business owners.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in proprietor income. Moreover, construction services are not purchased through a third-party retailer, so pricing margins were not applicable for this economic sector.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all SBD staff members reside in Los Angeles County. In other words, LADWP payroll costs were directly spent within the study area. Similarly, Okapi employees who work on SBD live in Los Angeles County, so a 100% local purchase rate was applied to spending on Okapi labor. In contrast, four of the five SoCalGas employees working on SBD reside in Los Angeles County, so an 80% local purchase rate was applied to spending on SoCalGas labor. Without detailed billing data for each staff member, this local purchase rate assumes that all five employees at SoCalGas are paid the same hourly wage and worked the same amount of hours.

Detailed information was not available on the locations of contractors that received incentives. In the absence of this information, the default local purchase rate was assumed for spending on construction of new commercial structures (100%).

All construction projects must be located within the LADWP service area. It was assumed that all energy cost savings from these projects benefit local business owners. Thus, a 100% local purchase rate was modeled for the increase in proprietor income.

# 15. Upstream Heating, Ventilation, and Air Conditioning (HVAC)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Heating/Air Conditioning

**Budget in FY 2016-17:** $3,064,301

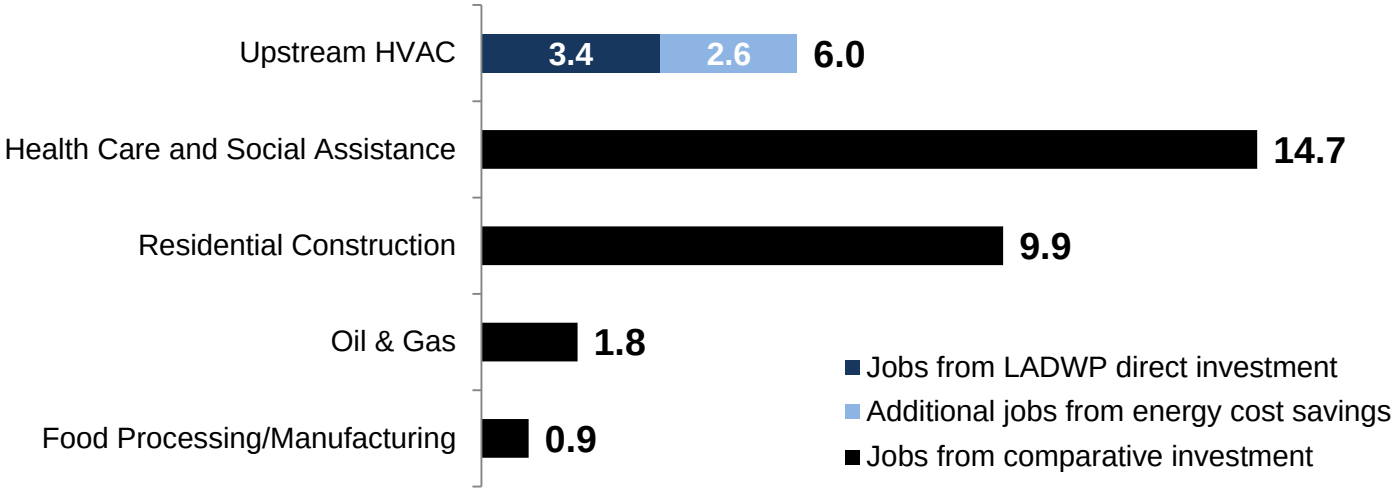
**Estimated Energy Cost Savings:** $1,576,929

**Employment Benefits:** 19 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $2,202,953 in Los Angeles County

**Labor Income:** $1,315,383 in Los Angeles County

**Jobs from Upstream HVAC vs. Benchmark Industries[118]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[118] No energy cost savings were assumed for benchmark industries.

## 15.1 Program Description

The Upstream Heating, Ventilation, and Air Conditioning (HVAC) program is designed to assist office buildings, hotels, hospitals/medical facilities, institutional facilities, retail, or any business acquire an energy efficient HVAC system. Through an agreement with participating distributors and manufacturers, the Upstream HVAC program provides incentives to stock and upsell high efficiency HVAC equipment. Contractors and HVAC customers can then immediately access premium replacement technology that might not have been readily available to them without the program. The upstream approach allows LADWP to capture energy savings at the point of sale which would not have been applied for in LADWP's downstream programs.

## 15.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in the Upstream HVAC program during fiscal year (FY) 2016-17, totaling $3,064,301, is supporting **10.4** full-time equivalent (FTE) job-years in Los Angeles County (or 3.4 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $1,576,928.71 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **7.9** FTE job-years (or 2.6 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **18.3** FTE-jobs years in Los Angeles County (or 6 FTE job-years per million dollars of LADWP investment). See **Table 15.1** for a breakdown of employment benefits by direct, indirect, and induced jobs.[119]

**Table 15.1 Direct, Indirect, and Induced Jobs Supported by the Upstream HVAC program[120]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,064,301) | 5.0 | 2.8 | 2.6 | **10.4** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,576,929) | 1.6 | 0.2 | 6.1 | **7.9** |
| **Total** | **6.6** | **3.0** | **8.7** | **18.3** |

[119] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[120] Disaggregated numbers may not add up to totals due to rounding.

## 15.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from the Upstream HVAC program, including value added and labor income. We estimate that LADWP's investment in the Upstream HVAC program during FY 2016-17 added a total of **$2.2** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 60% of the total value added. See **Tables 15.2** and **15.3** for a summary of the direct, indirect, and induced impacts of the Upstream HVAC program on value added and labor income, respectively, in Los Angeles County.[121]

**Table 15.2 Value Added by the Upstream HVAC program [122]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,064,301) | $832,169 | $312,242 | $277,980 | **$1,422,391** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,576,929) | $105,467 | $26,507 | $648,588 | **$780,562** |
| **Total** | **$937,636** | **$338,749** | **$926,568** | **$2,202,953** |

**Table 15.3 Labor Income from the Upstream HVAC program [123]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($3,064,301) | $472,181 | $202,208 | $157,025 | $831,414 |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($1,576,929) | $101,913 | $14,945 | $367,112 | $483,970 |
| **Total** | **$574,094** | **$217,153** | **$524,137** | **$1,315,383** |

[121] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[122] Disaggregated numbers may not add up to totals due to rounding.
[123] See footnote above.

## 15.4 Methodology

In order to estimate the employment and economic benefits of the Upstream HVAC program, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data was used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 15.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 0.4% of the total jobs, 0.9% of the total value added, and 1.5% of the total labor income reported for the Upstream HVAC program in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 15.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to the Upstream HVAC program (including regular and overtime) translated to 0.1 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 0.6% of all program expenses.

### 15.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 15.1**.

#### LADWP Funding

In FY 2016-17, a total of $3,064,301 in LADWP funding was expended on the Upstream HVAC program. Funds were spent on a mix of LADWP labor, overhead costs, and supporting services provided by Energy Solutions, a third-party contractor. See **Appendix 15.1** for a summary of how these program funds were spent according to cost category.

### Co-investment

The Upstream HVAC program is designed to compensate HVAC distributors for the operational costs associated with stocking and selling energy-efficient HVAC systems compared to conventional HVAC systems. These marginal costs may include hiring additional sales representatives to educate customers about energy-efficient technologies, or securing warehouse space for the energy-efficient HVAC systems, which tend to be larger than traditional systems. Without detailed information on the marginal costs that distributors face in selling energy-efficient equipment, it is assumed that the financial incentives offered by the Upstream HVAC program completely offset those increased costs. Thus, no co-investment was modeled towards the economic benefits generated by the program.

### Energy Cost Savings

LADWP estimates that the Upstream HVAC program saved a total of 10,374,531 kilowatt hours (kWh) in FY 2016-17. According to LADWP, around 90% of these energy savings are realized by commercial ratepayers and 10% are realized by institutional ratepayers. Using an average per kilowatt cost of $0.153 for commercial ratepayers and $0.143 for institutional ratepayers, the total value of the energy savings came out to $1,709,046. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. The same method was used to obtain the $0.143 energy cost for institutional ratepayers. These are all-inclusive numbers, accounting for taxes, fees, and other related costs that customers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by the upstream HVAC program, funds were tracked according to how they were actually spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Program funds spent on incentives were modeled as wholesale trade in IMPLAN, a sector which include distributors of air conditioning equipment. This industry was selected because incentive funding compensates distributors for the increased operational costs associated with warehousing and selling energy-efficient HVAC systems (e.g., hiring additional sales representatives to educate customers about energy efficient technologies, renting additional warehouse space for the energy-efficient HVAC systems, etc.).

Spending on outside services (Energy Solutions) were modeled as architecture, engineering, and related services. This industry represents Energy Solution’s primary set of business

activities, rather than the specific activities that the company performed for the Upstream HVAC program (i.e., program design, outreach, implementation, and incentive payment support). Since IMPLAN relies upon industry averages for modeling employment and economic impacts, Energy Solution's primary business activities were assumed to be the best proxy for modeling its hiring and spending practices.

Energy cost savings for commercial customers were modeled as an increase in proprietor income in IMPLAN, which averages together the many ways in which a self-employed individual may spend an increase in income, including both savings and the purchase of goods and services. In other words, it is assumed that energy cost savings translate to increased profits for business owners.

Energy cost savings for institutional customers were modeled across three economic sectors in IMPLAN. Savings for elementary and secondary schools, including public, private, and charter schools, were modeled as spending on elementary and secondary schools in IMPLAN. Savings for universities were modeled as spending on junior colleges, colleges, universities, and professional schools. Lastly, savings for government agencies was modeled as spending on other local government enterprises. In all cases, it is assumed that energy cost savings are reinvested in each sector's general operating costs.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, margins were not applicable for modeling energy cost savings realized by commercial and institutional customers. Moreover, wholesale trade services and architecture, engineering, and related services are not purchased through a third-party retailer, so margins were not applicable for these economic sectors.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN

already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 37% local purchase rate. This percentage accounts for the place of residence, billing rate, and hours worked for each staff member billing to the program. In other words, around 37% of spending on LADWP employee compensation went to residents of Los Angeles County.

Spending on wholesale trade was modeled with a local purchase rate of 40%, which according to LADWP, is the percentage of incentives paid to distributors located in Los Angeles County. The remaining incentives were paid to distributors located outside of Los Angeles County, but who ultimately sell HVACs downstream to commercial and institutional customers located in the City of Los Angeles.

Spending on architecture, engineering, and related services was modeled with 44% local purchase rate. This percentage accounts for the place of residence of each staff member at Energy Solutions billing to the program (three out of seven), but not the billing rate or hours worked by each of those staff members. In other words, this local purchase rate is not weighted according to the salaries of the Energy Solutions staff members that live in Los Angeles County.

Since the upstream incentives are ultimately designed to accelerate the adoption of energy-efficient HVAC systems within LADWP's service area, it is assumed that all energy cost savings benefit local businesses and institutions. Thus, a 100% local purchase rate was modeled for the increase in proprietor income, as well as the savings that institutional customers reinvest back into their respective economic sectors (i.e., elementary and secondary schools; junior colleges, colleges, universities, and professional schools; and other local government enterprises).

# 16. California Advanced Home Program (CAHP)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Energy Efficiency, Water Conservation, Gas Conservation, Solar PV, Solar Water Heating

**Budget in FY 2016-17:** $2,710,211

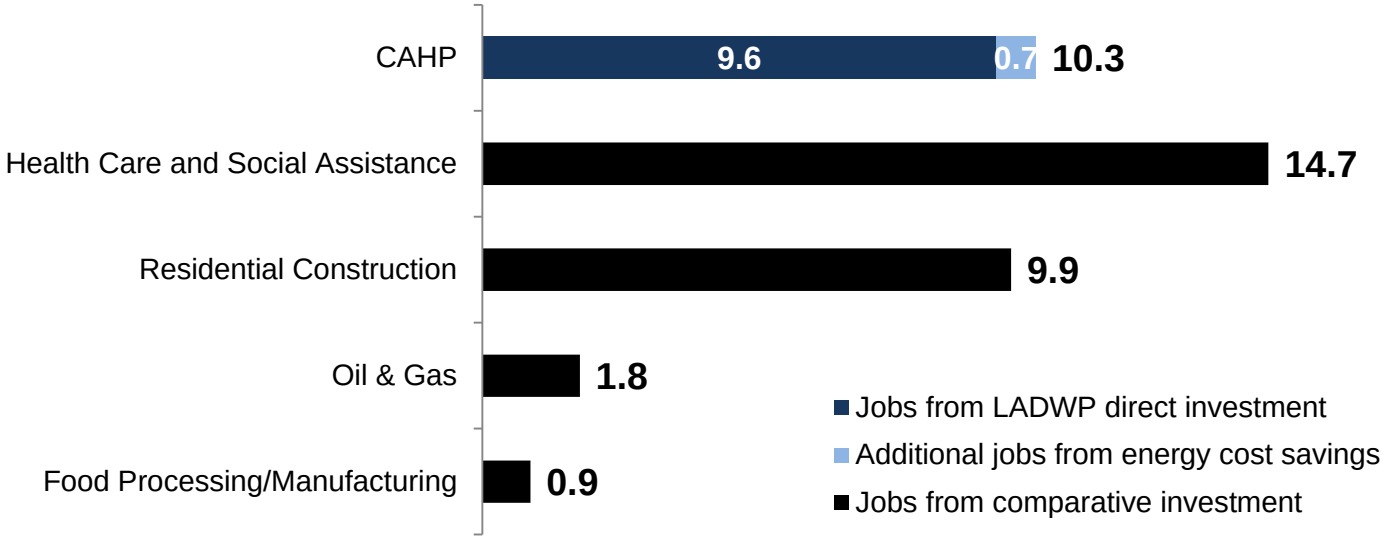
**Estimated Energy Cost Savings:** $341,546

**Employment Benefits:** 28 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $2,742,648 in Los Angeles County

**Labor Income:** $1,825,826 in Los Angeles County

**Jobs from CAHP vs. Benchmark Industries[124]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[124] No energy cost savings were assumed for benchmark industries.

## 16.1 Program Description

The California Advanced Home Program (CAHP) is an incentive program that utilizes the statewide CAHP through its partner utility, Southern California Gas Company (SoCalGas), to incentivize cost-effective energy efficiency upgrades in residential new construction. CAHP targets high-density residential new construction, including single- and multi-family high rise buildings, as this is the area with the greatest new construction energy savings potential in LADWP's service territory.

Through a combination of education, design assistance, and financial support, CAHP works with building and related industries to exceed compliance with the California Code of Regulations, Title 24, Part 6, Building Energy Efficiency Standards (Title 24) for residential and non-residential buildings. Compliance with Title 24 must be demonstrated through the performance method utilizing approved California Energy Commission compliance software. Compliance must be demonstrated for each building as a whole and may not group unrelated or detached buildings together.

## 16.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in CAHP during fiscal year (FY) 2016-17, totaling $2,710,211, is supporting **26** full-time equivalent (FTE) job-years in Los Angeles County (or 9.6 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $341,546 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **2.0** FTE job-years (or 0.7 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **28** FTE-jobs years in Los Angeles County (or 10.3 FTE job-years per million dollars of LADWP investment). See **Table 16.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[125]

**Table 16.1 Direct, Indirect, and Induced Jobs Supported by CAHP[126]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,710,211) | 14.2 | 7.4 | 4.4 | **26.0** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($341,546) | - | - | 2.0 | **2.0** |
| **Total** | **14.2** | **7.4** | **6.4** | **28.0** |

[125] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[126] Disaggregated numbers may not add up to totals due to rounding.

## 16.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from CAHP, including value added and labor income. We estimate that LADWP's investment in CAHP during FY 2016-17 added a total of **$2.7** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 67% of the total value added. See **Tables 16.2** and **16.3** for a summary of the direct, indirect, and induced impacts of CAHP on value added and labor income, respectively, in Los Angeles County.[127]

**Table 16.2 Value Added by CAHP[128]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,710,211) | $1,181,859 | $795,558 | $548,980 | **$2,526,397** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($341,546) | - | - | $216,251 | **$216,251** |
| **Total** | **$1,181,859** | **$795,558** | **$765,231** | **$2,742,647** |

**Table 16.3 Labor Income from CAHP[129]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,710,211) | $946,146 | $448,192 | $310,177 | **$1,704,515** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($341,546) | - | - | $121,311 | **$121,311** |
| **Total** | **$946,146** | **$448,192** | **$431,488** | **$1,825,826** |

[127] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[128] Disaggregated numbers may not add up to totals due to rounding.
[129] See footnote above.

## 16.4 Methodology

In order to estimate the employment and economic benefits of CAHP, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 16.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 4% of the total jobs, 7% of the total value added, and 10% of the total labor income reported for CAHP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 16.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed by LADWP employees to CAHP (including regular and overtime) translated to 0.1 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 32% of all program expenses.

#### SoCalGas Employees

LADWP implements the program in collaboration with the Southern California Gas Company (SoCalGas). In FY 2016-17, to the hours billed by SoCalGas translated to 1.1 FTEs. During the same period, direct spending on SoCalGas employee compensation totaled 6% of all program expenses.

### 16.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 16.1**.

### LADWP Funding

In FY 2016-17, a total of $2,710,211 in LADWP funding was expended on CAHP. Funds were spent on a mix of LADWP labor, SoCalGas labor, overhead costs, and incentives. See **Appendix 16.1** for a summary of how program funds were spent according to cost category.

### Co-investment

CAHP is designed to compensate contractors and developers for the additional cost they face when adopting energy efficiency measures that go beyond those required by Title 24. Without detailed project level cost data, it is assumed that the financial incentives offered by CAHP largely offset those increased costs. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

Using Title 24 as the baseline, SoCalGas employs state of the art energy modeling software to calculate the kilowatt hours (kWh) savings for each CAHP project and reports this information monthly to LADWP. These calculations are subject to evaluation and verification by LADWP engineering staff. Based on these savings calculations LADWP estimates that CAHP saved a total of 2,161,682 kWh in FY 2016-17.

Using an average per kilowatt cost for residential customers of $0.158, the value of the energy savings came out to $341,546. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and all other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CAHP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. Similarly, program funds that went to SoCalGas were modeled as an increase in employee compensation because these funds are assumed to be primarily spent on payroll. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Program funds spent on incentives were modeled in IMPLAN as spending in two residential construction sectors (construction of single-family residential structures and construction of multi-family residential structures). These two industries were selected because incentive funding compensates contractors and developers for the increased construction costs associated with adopting energy efficiency measures in new homes and multi-family structures

that go beyond those required by Title 24. According to program expenditure data, the majority of incentive spending (96.7%) goes towards multi-family structures.

Since CAHP ultimately benefits residential customers, energy cost savings were modeled as increase in household income in IMPLAN, which is a unique economic activity within the model. This economic activity averages together the many ways in which an increase in household income may be spent, including both savings and the purchase of goods and services. In other words, an increase in household income represents a mix of industries that reflect typical consumer spending patterns.[130]

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in household income. Moreover, construction services are not purchased through a third-party retailer, so pricing margins were not applicable for this economic sector.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all CAHP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. In contrast, a 50% local purchase rate was applied to spending on SoCalGas labor because only half of the 14 staff members that bill to the program could be confirmed as living in Los Angeles County. Without

[130] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of CAHP beneficiaries, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

detailed billing data for each staff member, this local purchase rate assumes that all 14 employees at SoCalGas are paid the same hourly wage and worked the same amount of hours.

Detailed information was not available on the locations of contractors that received incentives. In the absence of this information, the default local purchase rate was assumed for spending on construction sectors (nearly 100% for each sector).

CAHP requires all construction projects to be located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in household income for the building occupants who benefit from the program.

# 17. Los Angeles Unified School District Direct Install (LAUSD DI)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Lighting, Heating/Air Conditioning, Water Conservation, Gas Conservation

**Budget in FY 2016-17:** $721,640

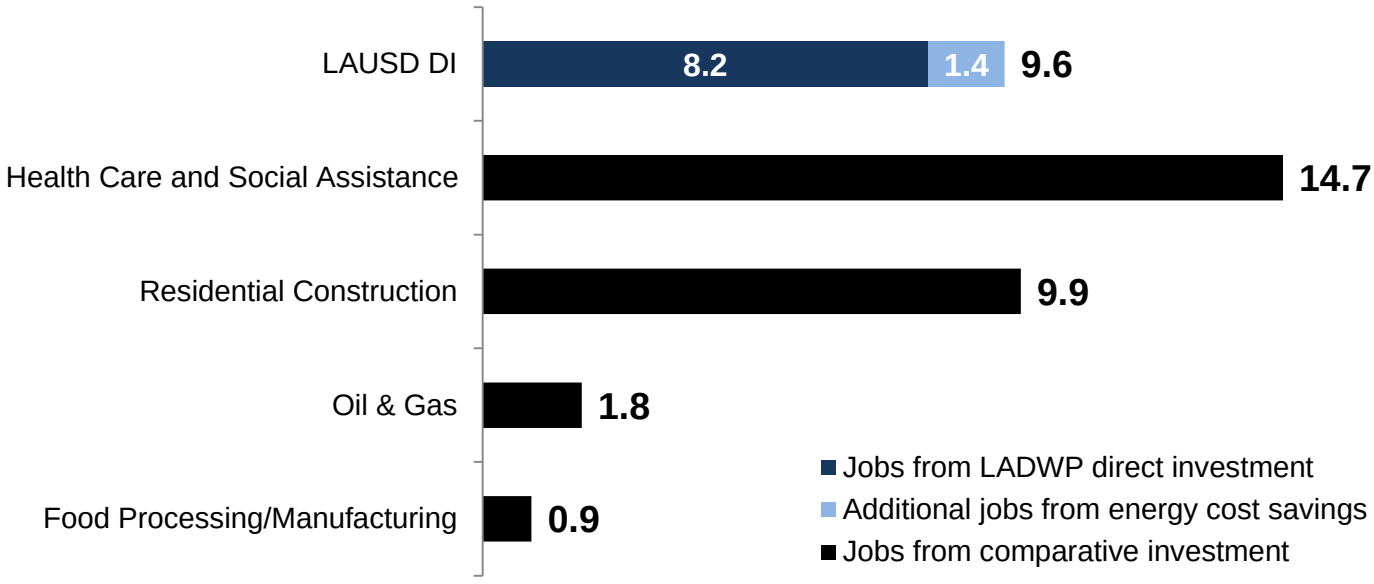
**Estimated Energy Cost Savings:** $82,227

**Employment Benefits:** 6.9 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $1,020,022 in Los Angeles County

**Labor Income:** $890,340 in Los Angeles County

**Jobs from LAUSD DI vs. Benchmark Industries[131]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[131] No energy cost savings were assumed for benchmark industries.

## 17.1 Program Description

The Los Angeles Unified School District Direct Install (LAUSD DI) program is designed to improve energy and water efficiency throughout LAUSD's facilities through upgrades in electric, water, and natural gas consuming systems, in partnership with the Southern California Gas Company (SoCalGas). This program provides energy efficiency design assistance, project management experience and retrofitting installation, utilizing LADWP engineering and power Construction Maintenance (PCM) group, to assist LAUSD facilities that need aid in reducing energy usage and corresponding utility expenses.

The LADWP and LAUSD project teams work together to identify schools with the greatest need for upgrades that will not be addressed through LAUSD's Proposition 39, the California Clean Energy Jobs Act. LADWP provides qualified staff with materials to install agreed-upon energy efficiency measures at identified schools. Measures include lighting retrofits, occupancy sensors, light-emitting diode (LED) exit signs, low-flow showerheads, faucet aerators, and pre-rinse spray valves.

## 17.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in LAUSD DI during fiscal year (FY) 2016-17, totaling $721,640, is supporting **5.9** full-time equivalent (FTE) job-years in Los Angeles County (or 8.1 FTE job-years per million dollars of LADWP investment). The program also saved $82,227 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **1.0** FTE job-years (or 1.4 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **6.9** FTE-jobs years in Los Angeles County (or 9.6 FTE job-years per million dollars of LADWP investment). See **Table 17.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[132]

**Table 17.1 Direct, Indirect, and Induced Jobs Supported by LAUSD DI[133]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($721,640) | 3.7 | 0 | 2.1 | **5.9** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($82,227) | 0.7 | - | 0.3 | **1.0** |
| **Total** | **4.5** | **0.2** | **2.4** | **6.9** |

[132] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[133] Disaggregated numbers may not add up to totals due to rounding.

## 17.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from LAUSD DI, including value added and labor income. We estimate that LADWP's investment in LAUSD DI during FY 2016-17 added a total of **$1** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 87% of the total value added. See **Tables 17.2** and **17.3** for a summary of the direct, indirect, and induced impacts of LAUSD DI on value added and labor income, respectively, in Los Angeles County.[134]

**Table 17.2 Value Added by LAUSD DI[135]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($721,640) | $671,732 | $5,629 | $227,495 | **$904,856** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($82,227) | $83,013 | - | $32,153 | **$115,166** |
| **Total** | **$754,745** | **$5,629** | **$259,648** | **$1,020,022** |

**Table 17.3 Labor Income from LAUSD DI[136]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($721,640) | $664,137 | $3,065 | $128,468 | **$795,669** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($82,227) | $76,514 | - | $18,157 | **$94,671** |
| **Total** | **$740,651** | **$3,065** | **$146,625** | **$890,340** |

[134] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[135] Disaggregated numbers may not add up to totals due to rounding.
[136] See footnote above.

## 17.4 Methodology

In order to estimate the employment and economic benefits of the LAUSD DI we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 17.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 49% of the total jobs, 63% of the total value added, and 72% of the total labor income reported for LAUSD DI in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 17.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to LAUSD DI (including regular and overtime) translated to 3.4 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 88% of all program expenses. Employees include program management staff, administrative staff, and a number of job classes within the Power Construction Maintenance (PCM) group, which performs the assessments and efficiency measure installations.

### 17.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 17.1**.

#### LADWP Funding

In FY 2016-17, a total of $721,640 in LADWP funding was expended on LAUSD DI. Funds were spent on a mix of LADWP labor, LAUSD labor, overhead costs, and materials. See **Appendix 17.1** for a summary of program spending according cost category.

### Co-investment

LAUSD DI does not require matching funds from LAUSD for energy efficiency upgrades. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that LAUSD DI program saved a total of 575,017 kilowatt hours (kWh) in FY 2016-17. Campus wide installations were completed at two schools in FY 2016-17, Sunland Elementary School and Raymond Elementary School, which corresponded to an annual estimated savings of 203,278 kWh and 172,950 kWh, respectively. Installations were completed for Mount Gleason Middle School across FY 2016-17 and FY 2017-18. The full project corresponded to 397,577 kWh in annual estimated savings, half of which was modeled here.

LADWP bills LAUSD at a discounted commercial rate for its electricity use. Schools and limited other institutions do not pay the same taxes on their electric bills as other commercial entities. This reduced tax obligation lowers the commercial rate from $0.153 per kWh to $0.143 per kWh. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage. After applying the reduced rate for institutional entities of $0.143 per kWh to the total energy savings estimated for LAUSD DI, total energy cost savings came to $82,227.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by LAUSD DI, funds were tracked according to how they were spent.

Program funds spent on LADWP energy efficiency program staff and PCM labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economy activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Material expenditures were modeled as spending on retail – building material and garden supply. This industrial sector is used when the exact type of materials is unknown, but the materials are likely construction products, tools, and other hardware. When modeled in IMPLAN, this sector captures the employment and economic impacts of the retail activities associated with selling building and garden materials, but not the manufacturing impacts.

Spending on outside services went to LAUSD to provide on-site supervision and facilitate the installation projects. This spending was modeled as employment and payroll only (local government, education) in IMPLAN, an industry code that represents the labor costs associated

with educational institutions. Unlike employee compensation, a more generic industry code in IMPLAN that yields only induced employment and economic impacts, spending on employment and payroll only (local government, education) yields direct and induced impacts. Thus, directs jobs at LAUSD did not need to be manually counted and added back into the outputs from IMPLAN. Likewise, the direct income for workers did not need to be added back in to the value added and labor income obtained in IMPLAN for this particular program.

Energy cost savings were also modeled in IMPLAN as employment and payroll only (local government, education). It is assumed that all of the energy cost savings realized by the school district are reinvested back in general operating expenses, which are primarily labor.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

It is assumed that miscellaneous materials were purchased from a third-party retailer. Thus, pricing margins were applied to these expenditures (modeled in IMPLAN as retail - building material and garden supply).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, margins were not applicable for the energy cost savings that LAUSD reinvests back into operational costs.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 79.53% local purchase rate, a percentage that accounts for the place of residence, billing rate, and hours worked for each staff member billing to the program. In other words, around 80% of spending on LADWP employee compensation went to residents of Los Angeles County.

Miscellaneous material expenditures were assumed to be purchased through local retailers. Thus, a local purchase rate of 100% was applied to retail - building material and garden supply.

Spending on professional and outside services (i.e., LAUSD) were also modeled with a local 100% purchase rate because all of these funds went to schools located within Los Angeles County. Likewise, all energy cost savings were modeled with a local purchase rate of 100% because these funds are returned to LAUSD, and are assumed to be spent on local labor.

# 18. Commercial Direct Install (CDI)

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Lighting, Water Conservation, Gas Conservation

**Budget in FY 2016-17:** $42,643,956

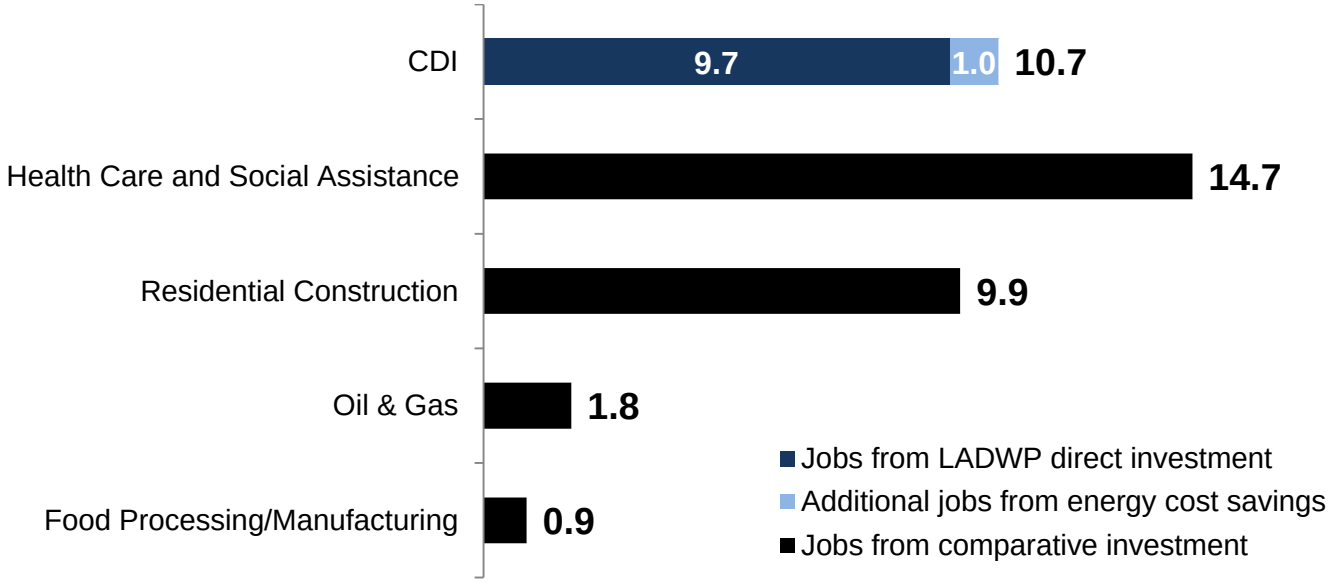
**Estimated Energy Cost Savings:** $10,838,167

**Jobs Supported:** 454.8 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $43,655,810 in Los Angeles County

**Labor Income:** $28,749,372 in Los Angeles County

**Jobs from CDI vs. Benchmark Industries[137]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[137] No energy cost savings were assumed for benchmark industries.

## 18.1 Program Description

The Commercial Direct Install (CDI) program targets small, medium, and large business customers in LADWP service territory, offering upgrades to targeted systems, including lights, water, and natural gas. LADWP is partnering with the Southern California Gas Company (SoCalGas) on CDI, with LADWP as the lead utility. This program is designed to integrate electric, water, and natural gas efficiency measures. LADWP is leveraging contract personnel, its Power Construction Maintenance (PCM) group, an IT system, and strategically-located community-based organizations to market and implement the program. The design is intended to maximize the electric, water, and natural gas cost savings in a cost-effective manner.

CDI is a direct install program implemented with the assistance of Lime Energy, an external vendor. As the program is currently designed, Lime Energy approaches potentially qualifying businesses and solicits their participation in the program. Contract or LADWP personnel then conduct an initial assessment to ascertain the qualifying measures applicable. If the business is interested in installing electric measures, contractor personnel will schedule and complete the installation. LADWP's staff installs all water and gas measures.

## 18.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's direct investment in CDI during fiscal year (FY) 2016-17, totaling $42,643,956, is supporting **412** full-time equivalent (FTE) job-years in Los Angeles County (or 9.7 FTE job-years per million dollars of LADWP investment). The program also saved commercial customers $10,838,167 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **43** FTE job-years (or 1.0 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **455** FTE-jobs years in Los Angeles County (or 10.7 FTE job-years per million dollars of LADWP investment). See **Table 18.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[138]

**Table 18.1 Direct, Indirect, and Induced Jobs Supported by CDI[139]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($42,643,956) | 232.2 | 97.1 | 82.6 | **411.8** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($10,838,167) | - | - | 43.0 | **43.0** |
| **Total** | **232.2** | **97.1** | **125..6** | **454.8** |

[138] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[139] Disaggregated numbers may not add up to totals due to rounding.

## 18.3 Economic Benefits

IMPLAN provides data for measuring the economic benefits from CDI, including value added and labor income. We estimate that LADWP's investment in CDI during FY 2016-17 added a total of **$43.7** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 66% of the total value added. See **Tables 18.2** and **18.3** for a summary of the direct, indirect, and induced impacts of CDI on value added and labor income, respectively, in Los Angeles County.[140]

**Table 18.2 Value Added by CDI[141]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($42,643,956) | $19,926,165 | $10,413,062 | $8,768,289 | $39,107,517 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($10,838,167) | - | - | $4,548,293 | $4,548,293 |
| **Total** | **$19,926,165** | **$10,413,062** | **$13,316,583** | **$43,655,810** |

**Table 18.3 Labor Income from CDI[142]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($42,643,956) | $15,405,716 | $5,814,562 | $4,954,223 | **$26,174,501** |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings ($10,838,167) | - | - | $2,574,871 | **$2,574,871** |
| **Total** | **$15,405,716** | **$5,814,562** | **$7,529,094** | **$28,749,372** |

[140] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[141] Disaggregated numbers may not add up to totals due to rounding.
[142] See footnote above.

## 18.4 Methodology

In order to estimate the employment and economic benefits of CDI, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 18.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 2% of the total jobs, 4% of the total value added, and 6% of the total labor income reported for CDI in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 18.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to CDI (including regular and overtime) translated to 8.7 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 4% of all program expenses. Employees include program management staff, administrative staff and a number of job classes within the Power Construction Maintenance (PCM) group, which performs the assessments and efficiency measure installations.

### 18.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 18.1**.

#### LADWP Funding

In FY 2016-17, a total of $42,643,956 in LADWP funding was expended on CDI. Funds were spent on a mix of LADWP labor, overhead costs, materials, and services provided by outside

contractors. See **Appendix 8.1** for a summary of how program funds were spent according to cost category.

### Co-investment

CDI does not require matching funds from participating commercial customers. Thus, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that CDI saved a total of 70,837,695 kilowatt hours (kWh) in FY 2016-17. Calculations are based on measures installed, operating hours of the business and other factors provided by Lime Energy.

Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $10,838,167. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other electricity related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CDI, funds were tracked according to how they were spent.

Program funds spent on LADWP energy efficiency program staff and PCM labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This economic activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Material expenditures incurred directly by LADWP were modeled as a mix of industries. The majority of these funds were spent on high-efficiency toilets and urinals (modeled in IMPLAN as pottery, ceramics, and plumbing fixture manufacturing), followed by hot water tank and pipe wrap (modeled as mineral wool manufacturing), and fittings for plumbing fixtures (modeled as plumbing fixture fitting and trim manufacturing), such as bathroom faucet aerators, kitchen faucet aerators, kitchen pre-rinse spray valves, and low-flow showerheads. See **Appendix 18.1** for a summary of how LADWP spending on materials was modeled in IMPLAN.

Spending by LADWP on outside services (i.e., Lime Energy and its subcontractors) was modeled in a variety of industries, as based on a sample of invoices provided by LADWP. The majority of these funds were spent on site assessments, installations, permit inspections, and other labor related costs (all of which were modeled as maintenance and repair construction of nonresidential structures in IMPLAN). The second largest expense was permit and plan check

fees, which were modeled as spending on employment and payroll only (local government, non-education) because it is assumed that these permitting fees ultimately pay for the payroll costs associated with public agency employees that review permit applications. The remaining expenses were split amongst fees for using lift equipment (modeled as commercial and industrial machinery and equipment rental and leasing), community-benefit organizations that promote CDI in targeted communities (modeled as civic and labor organizations), home assessment program software (modeled as software publishers), data usage fees (modeled as wireless telecommunicates carriers), lighting fixtures (modeled as other electronic component manufacturing), among other expenses that were too marginal to be included in the model (i.e., below 0.01% of program funds). See **Appendix 18.1** for a summary of how Lime Energy's costs were modeled in IMPLAN.

Energy cost savings were modeled as an increase in proprietor income in IMPLAN, which averages together the many ways in which a self-employed individual may spend an increase in income, including both savings and the purchase of goods and services. In other words, it is assumed that energy cost savings translate to increased profits for business owners.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

LADWP purchases water conservation materials from third-party suppliers. Thus, IMPLAN's default margins were applied to spending on high-efficiency toilets and urinals, hot water tank and pipe wrap, and fittings for plumbing fixtures. Similarly, Lime Energy purchased lighting materials from third-party suppliers, so margins were applied to spending on lighting fixtures.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, margins were not applicable for modeling energy cost savings realized by commercial and institutional customers. Moreover, pricing margins were not applicable for all service related sectors modeled for this program (e.g., maintenance and repair construction of nonresidential structures, civic and labor organizations, commercial and industrial machinery, and equipment rental and leasing, etc.).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 79.5% local purchase rate. This rate was based on the composition of the LADWP personnel that work on the LAUSD Direct Install program, rather than CDI, because detailed workforce data (including the place of residence of each staff member) was not made available for CDI. The workforce composition of the Los Angeles Unified School District Direct Install (LAUSD DI) program was chosen as a proxy because CDI and LAUSD DI are both direct install programs that have similar workforce needs. In summary, it is assumed that around 80% of LADWP spending on employee compensation for CDI went to residents of Los Angeles County.

All materials purchased by LADWP workers were assumed to be sourced from local retailers. However, IMPLAN's default local purchase rates were applied to the manufacturing stage along each manufacturing sector's supply chain. These local manufacturing percentages are relatively low because few manufacturers have production facilities located in Los Angeles County (ranging between 0.20% and 3.75%). Validating IMPLAN's built-in local purchase rates against actual sourcing and production information was outside the scope of this study.

Local purchase rates varied for the industries impacted by LADWP's spending on outside services (i.e., Lime Energy and its subcontractors). Lime Energy hires local union construction crews to assess businesses and install energy efficiency measures, so a 100% local purchase rate was assumed for maintenance and repair construction of nonresidential structures. Similarly, Lime Energy hires local community-benefit organizations to promote CDI, so a 100% local purchase rate was assumed for spending on civic and labor organizations. IMPLAN's default local purchase rates were assumed for all other expenses incurred by Lime Energy because detailed sourcing information for these expenses was not available.

CDI requires that all installations occur at properties located within the LADWP service area. Thus, a 100% local purchase rate was applied to the increase in proprietor income (vis-à-vis energy cost savings) for participating customers.

# 19. Food Service Program

**Program Type:** Commercial, Industrial, & Institutional

**Intervention Type**: Commercial Food Appliances

**Budget in FY 2016-17:** $265,426

**Estimated Co-investment:** $32,981

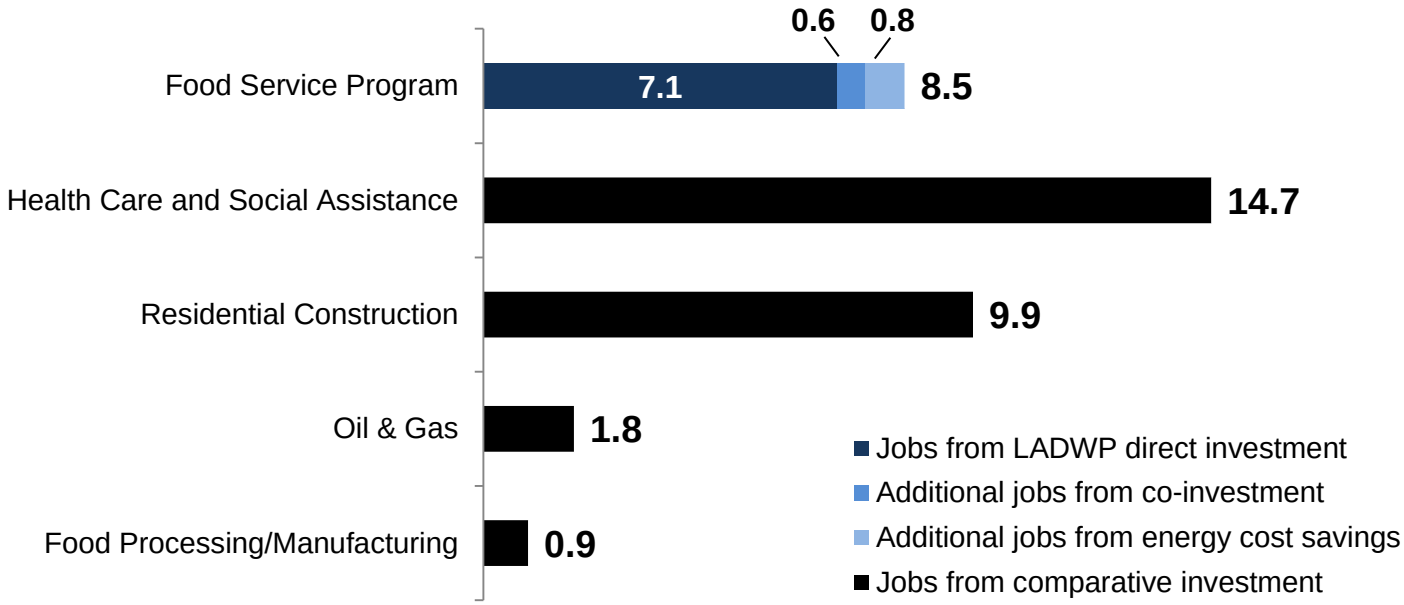
**Estimated Energy Cost Savings:** $53,977

**Employment Benefits:** 2.3 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $300,225 in Los Angeles County

**Labor Income:** $243,402 in Los Angeles County

**Jobs from the Food Service Program vs. Benchmark Industries**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**



## 19.1 Program Description

The Food Service Program offers incentives to encourage retrofit measures and technologies to reduce energy consumption in supermarkets, liquor stores, convenience stores, restaurants, hospitals, schools, and other businesses with food preparation or refrigeration equipment. Rebates are offered for commercial food appliances such as refrigerated cases, ice machines, reach-in freezers/refrigerators, commercial ovens, electric steamers, and other refrigeration and cooking equipment.

The Food Service Program is jointly-funded between LADWP and the Southern California Gas Company (SoCalGas). Comprehensive rebates are offered for new or replacement energy-efficient equipment. To qualify for rebates from $20 to $5,000, the equipment must meet the minimum requirements established by Be Energy Wise, a coalition of California investor-owned utilities (IOUs). Applicants in the joint LADWP and SoCalGas territory can apply for rebate(s) online or by email, fax, or mail to SoCalGas for processing and payment.

## 19.2 Employment Benefits

We estimate that LADWP's direct investment in the Food Service Program during fiscal year (FY) 2016-17, totaling $265,426, is supporting **1.9** full-time equivalent (FTE) job-years in Los Angeles County (or 7.1 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, we estimate that businesses co-invested $32,981, supporting **0.1** FTE job-years (or 0.6 FTE job-years per million dollars of LADWP investment). The program also saved commercial ratepayers $53,977 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **0.2** FTE job-years (or 0.8 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **2.2** FTE-jobs years in Los Angeles County (or 8.5 FTE job-years per million dollars of LADWP investment). See **Table 19.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[143]

**Table 19.1 Direct, Indirect, and Induced Jobs Supported by the Food Service Program[144]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($265,426) | 1.0 | 0.2 | 0.7 | **1.9** |
| Co-investment ($32,981) | 0.1 | >0.1 | >0.1 | **0.1** |
| Energy Cost Savings ($53,977) | - | - | 0.2 | **0.2** |
| **Total** | **1.1** | **0.2** | **0.9** | **2.3** |

[143] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[144] Disaggregated numbers may not add up to totals due to rounding.

## 19.3 Economic Benefits

We estimate that LADWP's investment in Food Service Program during FY 2016-17 added a total of **$0.3** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 81% of the total value added. See **Tables 22.2** and **22.3** for a summary of the direct, indirect, and induced impacts of the Food Service Program on value added and labor income, respectively, in Los Angeles County.[145]

**Table 19.2 Value Added by the Food Service Program[146]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($265,426) | $163,691 | $20,271 | $73,613 | **$257,575** |
| Co-investment ($32,981) | $11,156 | $3,817 | $5,026 | **$19,999** |
| Energy Cost Savings ($53,977) | - | - | $22,652 | **$22,652** |
| **Total** | **$174,847** | **$24,087** | **$101,291** | **$300,225** |

**Table 19.3 Labor Income from the Food Service Program[147]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($265,426) | $162,690 | $11,497 | $41,574 | $215,761 |
| Co-investment ($32,981) | $9,812 | $2,166 | $2,839 | **$14,817** |
| Energy Cost Savings ($53,977) | - | - | $12,823 | **$12,823** |
| **Total** | **$172,502** | **$13,663** | **$57,237** | **$243,402** |

[145] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[146] Disaggregated numbers may not add up to totals due to rounding.
[147] See footnote above.

## 19.4 Methodology

No detailed program data was collected or analyzed for the Food Service Program. This program represents a small share of LADWP's total investment in energy efficiency. Based on the suite of programs studied in this report, the Food Service Program comprised 0.2% of LADWP's total investment in energy efficiency for FY 2016-17. Thus, to allow more attention to LADWP's larger programs, a detailed analysis of program expenditure and timesheet data was not conducted for the Food Service Program.

In the absence of detailed program data, the economic and employment benefits reported for the Food Service Program were based on the multipliers developed for the Commercial Lighting Incentive Program (CLIP). According to LADWP, the Food Service Program and CLIP are both commercial rebate programs that are similar in their design and implementation, and should therefore have similar employment and economic impacts from each dollar of direct investment. Likewise, both programs are assumed to generate similar levels of co-investment per dollar of direct investment. CLIP, however, generates three times as many kilowatt hour (kWh) savings as the Food Service Program per dollar of direct investment. Thus, the multipliers from CLIP were modified to reflect the energy cost savings that one would expect for the Food Service Program, based on FY 2016-17 estimates.[148] The methods for developing CLIP's multipliers are described in **Chapter 12**.

[148] LADWP estimates that the Food Service Program saved a total of 352,789 kilowatt hours in FY 2016-17. Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $53,977. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total commercial kWh consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

# 20. City Plants

**Program Type:** Cross-cutting

**Intervention Type**: Shade Trees for Homes and Buildings

**Budget in FY 2016-17:** $2,280,000

**Co-investment:** $315,000

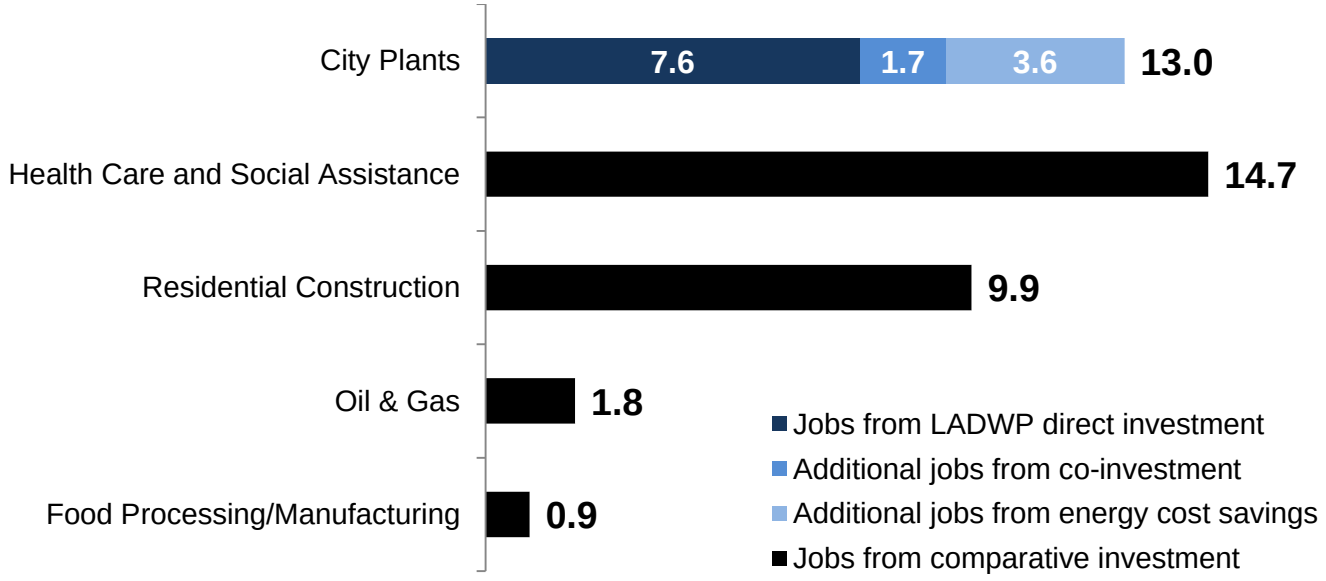
**Estimated Energy Cost Savings:** $1,528,101

**Employment Benefits:** 29.6 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $3,497,218 in Los Angeles County

**Labor Income:** $1,919,116 in Los Angeles County

**Jobs from City Plants vs. Benchmark Industries[149]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[149] No co-investment energy cost savings were assumed for benchmark industries.

## 20.1 Program Description

The City Plants program provides free shade trees for residents and property owners in the City of Los Angeles. The program seeks to improve canopy cover, air quality, stormwater retention, and building energy efficiency. City Plants focuses on providing trees for residential customers, but also provides trees to commercial customers and plants a smaller number of trees on residential parkways, commercial parkways, and other city property. The program encourages the planting of trees that are adapted to the region's semi-arid climate and use less water.

City Plants is operated by a nonprofit entity of the same name. The City Plants nonprofit is a unique hybrid organization administered by staff within Los Angeles' Board of Public Works in collaboration with Community Partners, a nonprofit that provides administrative structure for civic projects in Southern California. Trees are delivered by the Los Angeles Conservation Corps (LACC), Fuego Tech Rangers, Los Angeles Beautification Team, Koreatown Youth and Community Center, Northeast Trees, A Cleaner Greener East LA, and TreePeople. The resident or property owner is responsible for planting the trees, except for parkway trees which may be eligible for concrete cuts and planting by the city or its partners. City Plants is supported by donations and sponsorships, with LADWP as the largest single sponsor of planting activities.

## 20.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in the City Plants program during fiscal year (FY) 2016-17, totaling $2,280,000, is supporting **17.4** full-time equivalent (FTE) job-years in Los Angeles County (or 7.6 FTE job-years per million dollars of LADWP investment). Along with LADWP's financial contribution, the City Plants nonprofit organization co-invested $315,000, supporting **4** FTE job-years (or 1.7 FTE job-years per million dollars of LADWP investment). The program also saved ratepayers $1,528,101 in estimated energy costs, which are reinvested back into the economy, supporting **8.3** FTE job-years (or 3.6 FTE job-years per million dollars of LADWP investment). When added together, these three investment streams support a total of **29.6** FTE-jobs years in Los Angeles County (or 13.0 FTE job-years per million dollars of LADWP investment). See **Table 20.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[150]

**Table 20.1 Direct, Indirect, and Induced Jobs Supported by City Plants[151]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,280,000) | 12.6 | 1.3 | 3.4 | **17.4** |
| Co-investment ($315,000) | 3.9 | - | 0.1 | **4.0** |
| Energy Cost Savings ($1,528,101) | - | - | 8.3 | **8.3** |
| **Total** | **16.5** | **1.3** | **11.8** | **29.6** |

[150] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[151] Disaggregated numbers may not add up to totals due to rounding.

## 20.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from City Plants, including value added and labor income. We estimate that LADWP's investment in City Plants during FY 2016-17 added a total of **$3.5** million in value to Los Angeles County's economy, including the effects of co-investment and energy cost savings. Labor income comprises 55% of the total value added. See **Tables 20.2** and **20.3** for a summary of the direct, indirect, and induced impacts of City Plants on value added and labor income, respectively, in Los Angeles County.[152]

**Table 20.2 Value Added by City Plants[153]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,280,000) | $1,646,346 | $151,037 | $366,465 | **$2,163,847** |
| Co-investment ($315,000) | $296,878 | $6,062 | $94,598 | **$397,538** |
| Energy Cost Savings ($1,528,101) | - | - | $935,833 | **$935,833** |
| **Total** | **$1,943,224** | **$157,099** | **$1,396,896** | **$3,497,218** |

**Table 20.3 Labor Income from City Plants[154]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,280,000) | $746,312 | $89,801 | $206,935 | **$1,043,049** |
| Co-investment ($315,000) | $293,683 | $3,663 | $53,422 | **$350,768** |
| Energy Cost Savings ($1,528,101) | - | - | $525,299 | **$525,299** |
| **Total** | **$1,039,995** | **$93,464** | **$785,656** | **$1,919,116** |

[152] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[153] Disaggregated numbers may not add up to totals due to rounding.
[154] See footnote above.

## 20.4 Methodology

In order to estimate the employment and economic benefits of the City Plants program, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 20.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 13% of the total jobs, 2% of the total value added, and 3% of the total labor income reported for the City Plants program in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 20.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to the City Plants Program by LADWP employees (including regular and overtime) translated to 0.1 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 3% of all program expenses.

#### City Plants Employees

LADWP implements the program in collaboration with City Plants, a public-private partnership between the City of Los Angeles and Community Partners. Based on an interview with staff at City Plants, there is a total of 3.75 FTEs at the organization who work on the program, and 88% of the organization's budget in FY 2016-17 was spent on employee compensation.

### 20.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 20.1**.

### LADWP Funding

In FY 2016-17, a total of $2,280,000 in LADWP funding was expended on the City Plants program. Funds were spent on a mix of LADWP labor, overhead costs, and services provided by LACC and other nonprofits. See **Appendix 20.1** for a summary of how program funds were spent according to cost category.

### Co-investment

The City Plants program leverages a significant share of outside funds from local nonprofit organizations to cover implementation costs. For example, the City Plants nonprofit had an operating budget of $315,000 in FY 2016-17, which paid for staff salaries and general administrative costs. According to staff at the nonprofit, the organization would not exist without the financial support from LADWP for implementation costs (e.g., trees, planting materials, delivery services, maintenance, etc.). Thus, all $315,000 in co-investment was modeled towards the economic benefits generated by the program.

Additional funds were leveraged from other local nonprofits that served as subcontractors (e.g., LACC, Koreatown Youth and Community Center, the Los Angeles Beautification Team, Fuego Tech Fire, North East Trees, TreePeople, and A Cleaner Greener East LA). These nonprofits, however, were unable to share financial data that clearly delineated leveraged funds from LADWP funds for the purposes of this particular program. Thus, the co-investment modeled for this program only captures the operating expenses of the City Plants nonprofit, and is likely an underestimate of the total co-investment induced by the program.

### Energy Cost Savings

LADWP estimates that the City Plants program saved a total of 9,702,229 kilowatt hours (kWh) in FY 2016-17. City Plants utilizes tools developed by the U.S. Forest Service to calculate energy savings and climate benefits from the trees planted. This carbon calculator estimates kWh saved from shading (and decreased use of air conditioning) on an annual basis over the expected life of the tree. The tool also calculates more general climate and ambient cooling benefits from these trees, and presents them in kWh saved.

According to LADWP staff, around 90% of these energy savings are realized by residential ratepayers and 10% are realized by commercial ratepayers. Using an average per kilowatt cost of $0.158 for residential ratepayers and $0.153 for commercial ratepayers, the value of the energy savings came out to $1,528,101. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from residential ratepayers. The same method was used to obtain the $0.153 energy cost for commercial ratepayers. These are all-inclusive numbers, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the overall economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial

sectors directly impacted by the City Plants program, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Spending by LADWP on outside services (i.e., LACC and its partner nonprofits) was modeled in a variety of industries, as based on the program budget prepared by LACC. The majority of these funds went to LACC and their partner nonprofits for tree delivery services, tree maintenance, and other work in the field. These funds were modeled in IMPLAN as spending on labor and civic organizations, an industry group that broadly represents establishments that promote the interests of their members. The remaining funds were spent on trees (modeled in IMPLAN as greenhouse, nursery, and floriculture production), concrete cuts (modeled as maintenance and repair construction of highways, streets, bridges, and tunnels), planting materials and tools (modeled as "retail stores - building material and garden supply), and miscellaneous project expenses (e.g., mileage, software packages, the development of promotional materials, etc.). See **Appendix 20.1** for a summary of how spending on professional and outside services was modeled.

Co-investment from the City Plants nonprofit was also modeled in a variety of industries. Most of this co-investment was spent on salaries and benefits, which were modeled as an increase in employee compensation in order to capture the induced impacts of payroll costs (direct benefits were captured from primary data). The remaining co-investment was spent on a diverse mix of administrative costs, such as catering expenses for meetings (modeled as food services), membership dues (modeled as labor and civic organizations), graphic design services (modeled as specialized design services), among many other small expenses. See **Appendices 20.1** and **20.2** for a summary of how the co-investment from the City Plants nonprofit was modeled.

Energy cost savings for residential customers were modeled in IMPLAN as an increase in household income, which averages together the many ways in which a household will spend an increase in income, including both savings and the purchase of goods and services.[155] Likewise, cost savings for commercial customers were modeled as an increase in proprietor income, which averages together the many ways in which a self-employed individual will spend an increase in income. In other words, it is assumed that energy cost savings translate to increased disposable income for residential customers and increased profits for commercial customers.

[155] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of program beneficiaries, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that LADWP funds, co-investment, and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In general, it is assumed that partner nonprofits were purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all material expenses, except for trees, which were are purchased directly from the nurseries that grow them.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in household income, proprietor income, and all service-related sectors impacted by the program (e.g., labor and civic organizations; maintenance and repair construction of highways, streets, bridges and tunnels; food services, etc.).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all City Plants staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area.

The local purchase rates for LADWP spending on outside services was based on purchasing information provided by LACC. When sourcing information could not be obtained the default local purchase rate was used.

Co-investment dollars that were spent on employee compensation for workers at the City Plants nonprofit were modeled with a local purchase of 73% (2.75 of the nonprofit's 3.75 FTEs live in Los Angeles County). This local purchase rate assumes that all employees at the nonprofit are paid the same wage. Material expenses covered by co-investment were modeled with the default local purchase rates.

Since all urban tree planting projects must be located within the LADWP service area, it is assumed that all energy cost savings benefit local business owners and residents. Thus, a 100% local purchase rate was modeled for the increase in proprietor and household income.

# 21. Codes, Standards, & Ordinances (CSO)

**Program Type:** Cross-cutting

**Intervention Type**: Building, Appliance, Construction, and Water Codes

**Budget in FY 2016-17:** $624,106

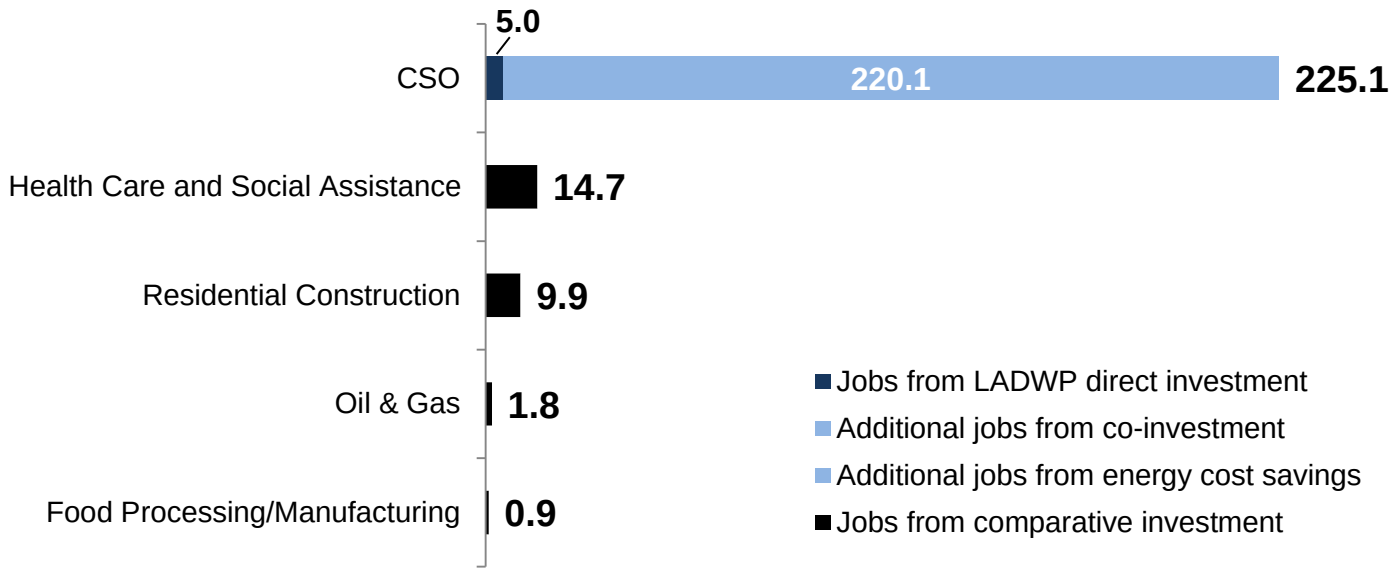
**Estimated Energy Cost Savings:** $27,126,831

**Employment Benefits:** 140.5 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $15,434,657 in Los Angeles County

**Labor Income:** $8,864,344 in Los Angeles County

**Jobs from CSO vs. Benchmark Industries[156]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[156] No energy cost savings were assumed for benchmark industries.

## 21.1 Program Description

The Codes, Standards, & Ordinances (CSO) program conducts advocacy activities to improve building, appliance, and water use efficiency regulations. These activities include monitoring and active participation in codes and standards development, legislative review, sponsorship of local ordinances, and participation in policy efforts with other City of Los Angeles departments, state agencies, and utilities. The goal of this program is to promote sustainability with regard to water and energy use. The principal audience includes the Los Angeles City Department of Building and Safety, Los Angeles City Planning, Los Angeles City Department of Public Works, and the Los Angeles City Council, which together develop and adopt codes and standards specific to the city that go beyond state and federal regulation. Other audiences include state agencies, which conduct periodic rulemakings to update energy efficiency and water conservation regulations and standards, and industry groups that conduct research and develop industry specific standards.

## 21.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's spending on CSO during fiscal year (FY) 2016-17, totaling $624,106, is supporting **3.1** full-time equivalent (FTE) job-years in Los Angeles County (or 5.0 FTE job-years per million dollars of LADWP investment). The program also saved ratepayers $27,126,832 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **137.4** FTE job-years (or 220.1 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **140.5** FTE-jobs years in Los Angeles County (or 225.1 job-years per million dollars of LADWDP investment). See **Table 21.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[157]

**Table 21.1 Direct, Indirect, and Induced Jobs Supported by CSO[158]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($624,106) | 1.5 | - | 1.6 | **3.1** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($27,126,832) | - | - | 137.4 | **137.4** |
| **Total** | **1.5** | - | **139.0** | **140.5** |

[157] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[158] Disaggregated numbers may not add up to totals due to rounding.

## 21.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from CSO, including value added and labor income. We estimate that LADWP's investment in CSO during FY 2016-17 added a total of **$15.4** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 57% of the total value added. See **Tables 21.2** and **21.3** for a summary of the direct, indirect, and induced impacts of CSO on value added and labor income, respectively, in Los Angeles County.[159]

**Table 21.2 Value Added by CSO[160]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($624,106) | $413,927 | $69 | $174,773 | **$588,769** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($27,126,832) | - | - | $14,845,888 | **$14,845,888** |
| **Total** | **$413,927** | **$69** | **$15,020,661** | **$15,434,657** |

**Table 21.3 Labor Income from CSO[161]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($624,106) | $413,895 | $38 | $98,695 | **$512,628** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($27,126,832) | - | - | $8,351,716 | **$8,351,716** |
| **Total** | **$413,895** | **$38** | **$8,450,411** | **$8,864,344** |

[159] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[160] Disaggregated numbers may not add up to totals due to rounding.
[161] See footnote above.

## 21.4 Methodology

In order to estimate the employment and economic benefits of CSO, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review the **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 21.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 1S% of the total jobs, 4% of the total value added, and 7% of the total labor income reported for CSO in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 21.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to CSO by LADWP employees (including regular and overtime) translated to 1.4 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 66% of all program expenses.

#### SoCalGas Employees

LADWP implements the program in collaboration with the Southern California Gas Company (SoCalGas). In FY 2016-17, to the hours billed by SoCalGas translated to 0.02 FTEs. During the same period, direct spending on SoCalGas employee compensation totaled 0.6% of all program expenses.

#### PG&E Employees

Pacific Gas and Electric Company (PG&E) is the main subcontractor for the project, but do not staff the program with any employees located in Los Angeles County. Thus, the FTE count recorded for PG&E was zero because this study focuses exclusively on the employment benefits of LADWP energy efficiency programs in Los Angeles County. Likewise, spending on PG&E employee compensation (33% of all program expenses) was not included in the economic benefits reported for the program.

### 21.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to

model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 21.1**.

### LADWP Funding

In FY 2016-17, a total of $624,106 in LADWP funding was expended on CSO. Funds were spent on a mix of LADWP labor, overhead costs, miscellaneous materials, and supporting services provided by external vendors. See **Appendix 21.1** for a summary of how program funds were spent according to cost category.

### Co-investment

In addition to the funds that LADWP spends on CSO, SoCalGas and PG&E also contribute matching funds towards advocacy activities. However, without detailed information on the amount of matching funds from partner and utilities, no co-investment was modeled for this program.

### Energy Cost Savings

LADWP estimates that CSO saved a total of 173,945,700 kilowatt hours (kWh) in FY 2016-17. This estimate was based on an energy savings model developed by the California statewide utility team. The model calculates the energy savings estimates of the all of the statewide teams investor-owned utilities (IOUs) for the codes and standards advocacy efforts. These are added together and divided by the total energy sales of the same IOUs to determine an energy savings per energy sold ratio. To determine the annual energy savings from codes and standards that would be expected in the LADWP service territory, the savings per sold energy factor is multiplied by LADWP's total annual energy sales. According to LADWP staff, around 59% of these estimated energy savings are realized by residential customers and 41% are realized by commercial customers.

Using an average per kilowatt cost of $0.158 for residential ratepayers and $0.153 for commercial ratepayers, the value of the energy savings came out to $27,126,832. The $0.158 energy cost came from a LADWP energy sales report that took a moving average of total residential kWh consumed and divided it by total revenue from residential ratepayers. The same method was used to obtain the $0.153 energy cost for commercial ratepayers. These are all-inclusive numbers, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by CSO, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Spending on outside services was spent on three activities. The majority of funds in this cost category were passed through to PG&E for research and consulting activities (96.7%). The remaining funds paid for administrative labor at SoCalGas (1.8%) and video development services provided by to Building Media (1.4%). Program funds that went to SoCalGas and PG&E were modeled as an increase in employee compensation in order to capture the induced impacts of these payroll costs (direct benefits were captured from primary data). Program funds that went to Building Media were modeled as in IMPLAN as spending in motion picture and video industries, an industrial sector which includes both labor and material expenses.

Miscellaneous material expenditures were modeled as spending on retail – miscellaneous store retailers. This industrial sector is used when the exact type of materials is unknown, but the materials are likely office supplies. When modeled in IMPLAN, this sector captures the employment and economic impacts of the retail activities associated with selling office supplies, but not the manufacturing impacts.

Energy cost savings for residential customers were modeled in IMPLAN as an increase in household income, which averages together the many ways in which a household will spend an increase in income, including both savings and the purchase of goods and services.[162] Likewise, energy cost savings for commercial customers were modeled as an increase in proprietor income. This economic activity averages together the many ways in which self-employed individuals and unincorporated business owners may spend an increase in income.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good.

[162] Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of program beneficiaries, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions.

When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for modeling an increase in household income and proprietor income. Moreover, video services are not purchased through a third-party retailer, so pricing margins were not applicable for this economic sector in IMPLAN.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all CSO staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area. At SoCalGas, half of the staff working on CSO live in Los Angeles County, so a local purchase rate of 50% was applied to employee compensation for these workers. This rate assumes that all SoCalGas employees working on the program are paid the same hourly wage and worked the same amount of hours. None of the staff at PG&E working on CSO live in Los Angeles County, so a local purchase rate of 0% was applied to employee compensation for these workers.

With respect to spending on video development, a local purchase rate of 0% was also applied. Building Media, the vendor of these services, is based out of Santa Barbara, California and Kent, Washington, so none of the funds spent on video development were assumed to be spent within Los Angeles County.

Miscellaneous material expenditures are assumed to be purchased through local retailers. Thus, a local purchase rate of 100% was applied to retail - miscellaneous store retailers.

Since CSO is designed to improve efficiency standards for building located in LADWP's service area, it is assumed that all energy cost savings benefit local businesses and residents. Thus, a 100% local purchase rate was modeled for the increase in proprietor and household income.

# 22. LADWP Facilities Upgrade

**Program Type:** Cross-cutting

**Intervention Type**: Lighting Upgrades for LADWP Facilities

**Budget in FY 2016-17:** $2,652,549

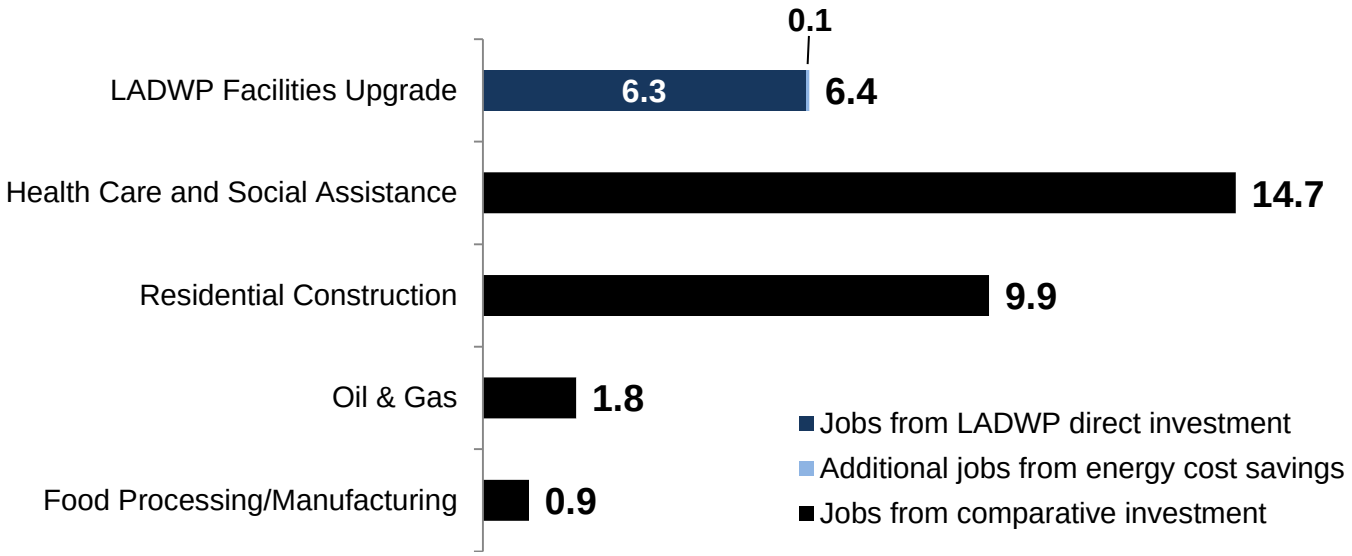
**Estimated Energy Cost Savings:** $168,955

**Employment Benefits:** 16.9 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $2,925,750 in Los Angeles County

**Labor Income:** $2,618,123 in Los Angeles County

**Jobs from LADWP Facilities Upgrade vs. Benchmark Industries[163]**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**




[163] No energy cost savings were assumed for benchmark industries.

## 22.1 Program Description

The LADWP Facilities Upgrade program strives to improve energy and water efficiency throughout LADWP's facilities. Energy efficiency measures included upgrades to lighting fixtures and HVAC systems, while water efficiency measures include upgrades to plumbing fixtures, leak corrections, and landscaping improvements. This chapter, however, only assesses the employment and economic benefits of the energy efficiency upgrades to LADWP facilities, which were all lighting related during the study period.

Projects are identified, prioritized, and scoped by LADWP Staff. LADWP's Power Construction Maintenance (PCM) group personnel then install the projects.

## 22.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in lighting upgrades at LADWP facilities during fiscal year (FY) 2016-17, totaling $2,652,549, is supporting **16.7** full-time equivalent (FTE) job-years in Los Angeles County (or 6.3 FTE job-years per million dollars of LADWP investment). The program also saved $168,955 in estimated energy costs, which is ultimately reinvested back into the economy, supporting **0.2** FTE job-years (or 0.1 FTE job-years per million dollars of LADWP investment). When added together, these two investment streams support a total of **16.9** FTE-jobs years in Los Angeles County (or 6.4 FTE job-years per million dollars of LADWP investment). See **Table 22.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[164]

**Table 22.1 Direct, Indirect, and Induced Jobs Supported by LADWP Facilities Upgrade[165]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,652,549) | 10.9 | 0.5 | 5.3 | **16.7** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($168,955) | 0.2 | - | - | **0.2** |
| **Total** | **11.1** | **0.5** | **5.3** | **16.9** |

[164] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[165] Lighting upgrades only. Disaggregated numbers may not add up to totals due to rounding.

## 22.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from the LADWP Facilities Upgrade program, including value added and labor income. We estimate that LADWP's investment in lighting upgrades at LADWP facilities during FY 2016-17 added a total of **$2.9** million in value to Los Angeles County's economy, including the effects of energy cost savings. Labor income comprises 89% of the total value added. See **Tables 22.2** and **22.3** for a summary of the direct, indirect, and induced impacts of the LADWP Facilities Upgrade program on value added and labor income, respectively, in Los Angeles County.[166]

**Table 22.2 Value Added by LADWP Facilities Upgrade[167]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,652,549) | $2,174,069 | $62,385 | $566,288 | **$2,802,743** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($168,955) | $70,836 | $29,474 | $22,697 | **$123,007** |
| **Total** | **$2,244,905** | **$91,859** | **$588,985** | **$2,925,750** |

**Table 22.3 Labor Income from LADWP Facilities Upgrade[168]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($2,652,549) | $2,196,613 | $34,863 | $319,799 | **$2,551,274** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings ($168,955) | $41,366 | $12,665 | $12,818 | **$66,849** |
| **Total** | **$2,237,979** | **$47,528** | **$332,617** | **$2,618,123** |

[166] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[167] Disaggregated numbers may not add up to totals due to rounding.
[168] See footnote above.

## 22.4 Methodology

In order to estimate the employment and economic benefits of the LADWP Facilities Upgrade program, we utilized two methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 22.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 49% of the total jobs, 66% of the total value added, and 74% of the total labor income reported for the LADWP Facilities Upgrade Program in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 22.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to the LADWP Facilities Upgrade program (including regular and overtime) translated to 8.3 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 73% of all program expenses. Employees include program management staff, administrative staff and a number of job classes within the PCM group, which performs the assessments and efficiency measure installations.

### 22.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 22.1.**

#### LADWP Funding

In FY 2016-17, a total of $2,652,549 in LADWP funding was expended on the lighting portion of the LADWP Facilities Upgrade program. Funds were spent on a mix of LADWP labor, overhead

costs, and materials. See **Appendix 22.1** for a summary of how program funds were spent according to cost category.

### Co-investment

The LADWP Facilities Upgrade program is an in-house program, so no outside funds were co-invested in the program. Thus, only LADWP direct investment and energy cost savings were modeled for this program.

### Energy Cost Savings

LADWP estimates that the lighting portion of the LADWP Facilities Upgrade program saved a total of 1,104,281 kilowatt hours (kWh) in FY 2016-17. This estimate was based on the difference in energy consumption (per hour) of the new lighting compared to the previous lighting and the number of hours of operation.

LADWP bills intra-departmental customers at the commercial rate. Using an average per kilowatt cost for commercial customers of $0.153, the value of the energy savings came out to $2,044,455. The $0.153 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed and divided it by total revenue from commercial ratepayers. It is an all-inclusive number, accounting for taxes, fees, and other related costs that consumers are billed for electricity usage.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by LADWP Facilities Upgrade program, funds were tracked according to how they were spent.

Program funds spent on LADWP energy efficiency program staff and PCM labor, benefits, and overhead were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Material expenses were split between indoor and outdoor light-emitting diodes (LEDs) and lighting fixtures. LEDs were modeled in IMPLAN as semiconductor and related device manufacturing, which is how LED manufacturing is classified according to the North American Industry Classification System (NAICS). Lighting fixtures were modeled in IMPLAN as lighting fixture manufacturing. According to program documentation, LED lights represent 94% of material expenses and fixtures represent 6% of material expenses.

Energy cost savings were modeled in IMPLAN as an influx of spending in the local government electric utilities sector. The industrial sector averages together the many operating costs that

these utilities incur. Thus, it is assumed that energy savings from the LADWP Facilities Upgrade program were reinvested back into LADWP's general operating budget.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds and energy cost savings were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

In the case of this program, it is assumed that PCM crew members are purchasing their materials from third-party suppliers rather than directly from the manufacturer. Thus, IMPLAN's default margins were applied to all material expenses (i.e., LEDs and lighting fixtures).

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Likewise, margins were not applicable for the energy-cost savings that LADWP reinvests back into operational budgets.

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 54% local purchase rate, a percentage that accounts for the place of residence, billing rate, and hours worked for each staff member billing to the program. In other words, around 54% of spending on employee compensation went to residents of Los Angeles County.

The local purchase rates for spending on materials were also based on actual program data. Around 97% of spending on LEDs and 22% of spending on lighting fixtures went to local suppliers. The local purchase rates at the manufacturing stage of the supply chains, however, were much lower. Around 0.3% of program funds for LED lights went to a manufacturer with production facilities located in Los Angeles County (i.e., Noribachi). And none of the program funds for lighting fixtures went to manufacturers with production facilities in Los Angeles County.

Energy cost savings were modeled with a local purchase rate of 100% because these funds are returned to LADWP. Modeling exactly how and where LADWP spends these savings was outside the scope of this study, so researchers relied on IMPLAN's built-in assumptions for the supply chain dynamics of local government electric utilities.

# 23. Program Outreach and Community Partnerships (POCP)

**Program Type:** Crosscutting

**Intervention Type**: Promotion of Incentive Programs by Nonprofit Organizations

**Budget in FY 2016-17:** $1,696,000

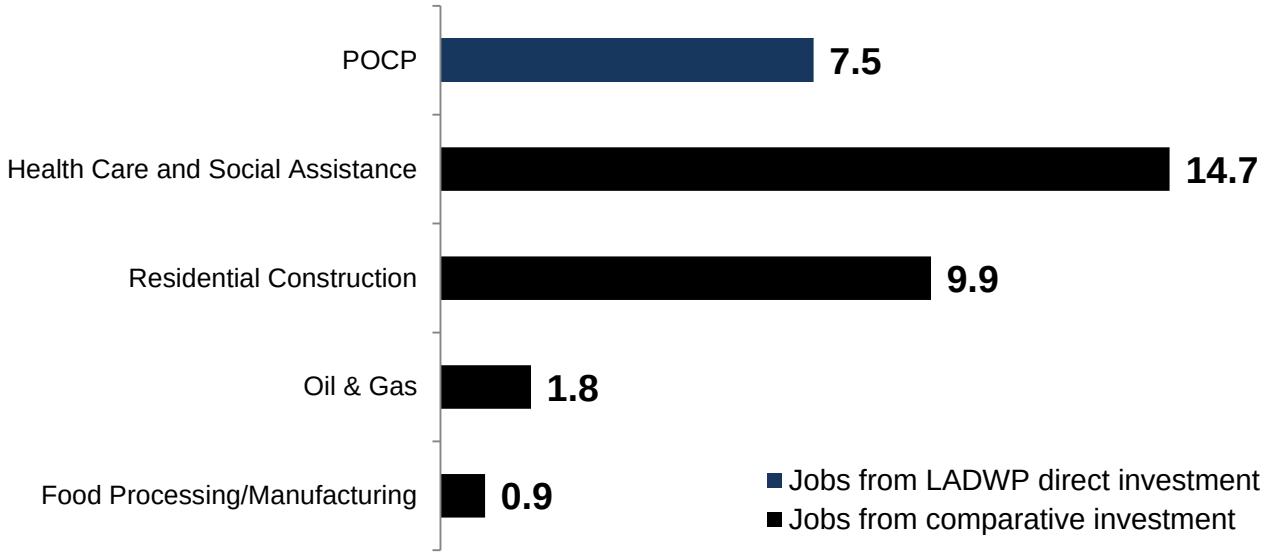
**Estimated Energy Cost Savings:** N/A

**Employment Benefits:** 12.7 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $1,854,874 in Los Angeles County

**Labor Income:** $1,064,345 in Los Angeles County

**Jobs from POCP vs. Benchmark Industries**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**



## 23.1 Program Description

The Program Outreach and Community Partnerships (POCP) program strives to improve customer awareness among LADWP's "hard-to-reach" customers of electric and natural gas efficiency and water conservation programs through the activities of community-based organizations. POCP offers grants to local nonprofit organizations that are awarded through a competitive selection process to work in one of the fifteen Los Angeles City Council Districts or on an at-large basis to improve community and customer awareness of LADWP's core energy efficiency and water conservation programs and free steps customers can take to reduce energy and water use. Typically, 15 council district grants are offered at $45,000 each, plus one peer facilitator grant at $45,000 and two to four at-large grants with awards of $45,000 or $90,000 each.

Leveraging their established community relationships, the nonprofit organizations are able to communicate and inform customers of the full suite of programs and services available to them from LADWP and SoCalGas, allowing the customers to participate in programs that they might not otherwise be aware of. Additionally, the nonprofits inform and educate their communities about simple behavioral changes that they can make in their homes, yards, or businesses that are completely free and will help them reduce their energy or water consumption, which may reduce the expenses to the household or business and correspondingly increase their profit or disposable income. In some cases, the nonprofit organizations will hire project staff to assist with program development and implementation of outreach and education activities.

## 22.2 Employment Benefits

After modeling the program in IMPLAN, we estimate that LADWP's investment in POCP during fiscal year (FY) 2016-17, totaling $1,696,000, is supporting **12.7** full-time equivalent (FTE) job-years in Los Angeles County (or 7.5 FTE job-years per million dollars of LADWP investment). See **Table 23.1** for a breakdown of these benefits by direct, indirect, and induced jobs.[169]

**Table 23.1 Direct, Indirect, and Induced Jobs Supported by POCP[170]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,696,000) | 8.1 | 1.1 | 3.6 | **12.7** |
| Co-investment (N/A) | - | - | - | **-** |
| Energy Cost Savings (N/A)[171] | - | - | - | **-** |
| **Total** | 8.1 | 1.1 | 3.6 | **12.7** |

[169] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[170] Disaggregated numbers may not add up to totals due to rounding.
[171] As a non-resource program, the energy savings accrued by this program are indirectly accrued and measured through the other LADWP resource programs analyzed in this report.

## 23.3 Economic Benefits

IMPLAN also provides data for measuring the economic benefits from POCP, including value added and labor income. We estimate that LADWP's investment in POCP during FY 2016-17 added a total of **$1.9** million in value to Los Angeles County's economy. Labor income comprises 57% of the total value added. See **Table 23.2** and **Table 23.3** for a summary of the direct, indirect, and induced impacts of POCP on value added and labor income, respectively, in Los Angeles County.[172]

**Table 23.2 Value Added by POCP[173]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,696,000) | $1,356,047 | $119,867 | $378,960 | $1,854,874 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings (N/A) | - | - | - | - |
| **Total** | **$1,356,047** | **$119,867** | **$378,960** | **$1,854,874** |

**Table 23.3 Labor Income from POCP[174]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($1,696,000) | $777,756 | $72,640 | $213,948 | $1,064,345 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings (N/A) | - | - | - | - |
| **Total** | **$777,756** | **$72,640** | **$213,948** | **$1,064,345** |

[172] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[173] Disaggregated numbers may not add up to totals due to rounding.
[174] See footnote above.

## 23.4 Methodology

In order to estimate the employment and economic benefits of POCP, we utilized two different methodologies: (1) analyze primary data to sum the number of FTE staff members and contractors working on the program, as well as their total compensation packages, and (2) model program expenditures in IMPLAN. The following section details the data used to inform each methodology. Before reading the following section, we recommend readers first review **Chapter 2 - Methodology**, which provides a detailed overview of the economic input-output model that was used in this study (IMPLAN Version 3.1).

### 22.4.1 Primary Data

Primary data was sourced from LADWP timesheets and expenditure records. The FTE counts derived from timesheets were classified as direct jobs because they deal with program implementation. Likewise all spending on employee compensation was classified as direct labor income and, by extension, direct value added. Results obtained from primary data comprised 4% of the total jobs, 18% of the total value added, and 32% of the total labor income reported for POCP in FY 2016-17. The remaining jobs, labor income, and value added were obtained from IMPLAN (see **Section 23.4.2, IMPLAN Inputs**).

#### LADWP Employees

According to timesheet data from FY 2016-17, the hours billed to POCP (including regular and overtime) translated to 0.5 FTEs. Based on program expenditure data for the same period, direct spending on LADWP employee compensation totaled 20% of all program expenses.

### 22.4.2 IMPLAN Inputs

All impacts that could not be assessed from primary data were modeled in IMPLAN. These include all of the indirect and induced impacts of the program, as well as the direct impacts from spending on materials and labor for which actual FTE counts were unavailable. In order to model the aforementioned impacts in IMPLAN, all financial flows associated with the program had to be tracked and totaled, including both LADWP funding, co-investment, and energy cost savings. After quantifying the investment totals, the details on how they were (or will be) spent also had to be determined, including identifying all of the affected industries, the spending timeline of the program, the presence or absence of pricing margins, and the local purchasing percentage. For a summary of this information, see **Appendix 23.1**.

#### LADWP Funding

In FY 2016-17, a total of $1,696,000 in LADWP funding was expended on POCP. Funds were spent on a mix of LADWP labor, overhead costs, services provided by nonprofit partners, and miscellaneous services provided by external vendors. See **Appendix 22.1** for a summary of how these program funds were spent according to different cost categories.

### Co-investment

Many of the grantees provide matching funds for offsetting program costs. However, matching funds are not required and grantees do not report their matches. Without more detailed information on the amount of matching funds from grantees, no co-investment was modeled for this program.

### Energy Cost Savings

As a non-resource program, the energy and water savings accrued in this program are indirectly accrued and measured through the LADWP resource programs such as the Consumer Rebate Program, Home Energy Improvement Program, Refrigerator Exchange, and Commercial Direct Install, among others. Energy savings are also achieved through conservation device distribution and behavior change. However, program staff has not yet been able to quantify these savings. Given the challenge of attributing energy savings directly to POCP activities, no energy cost savings were modeled for this program.

### Industrial Sectors

The industrial sectors directly impacted by investment flows strongly influence the economic benefits of a program. For each industrial sector, IMPLAN has built-in multipliers that translate investment dollars into job-years and economic output. To identify the industrial sectors directly impacted by POCP, funds were tracked according to how they were spent.

Program funds spent on LADWP labor, benefits, and overhead, were modeled as an increase in employee compensation in IMPLAN, a unique economic activity within the model. This activity represents all forms of employee compensation, including wages and benefits. IMPLAN only models the induced effects of employee compensation (i.e., the effects of workers spending their paychecks in the local economy), so the original value of these payroll costs was manually added to the direct economic impacts obtained from IMPLAN.

Spending on outside services was spent on a variety of industries, as based on the program budgets prepared by the grantees. The majority of these funds went to the partner nonprofits for outreach and activities. These funds were modeled in IMPLAN as spending on labor and civic organizations, an industry group that broadly represents establishments that promote the social interests of their members.[175] The remaining funds were spent on miscellaneous project expenses (e.g., printing, irrigation trainings, vehicle rentals, etc.). See **Appendix 23.1** for a summary of how spending on professional and outside services was modeled in IMPLAN.

### Spending Timeline

The economic benefits of an investment vary over time because of inflation and relative price changes, which IMPLAN accounts for through built-in deflators. It is assumed that program funds were spent between July 1, 2016 and June 30, 2017, (i.e., FY 2016-17). Without detailed

[175] Tracking the exact number of hours that staff at partner nonprofits worked on POCP was a major challenge. Since hourly billing data could not be obtained for all grantees, the direct jobs at partner nonprofits were modeled in IMPLAN using the built-in assumptions for “labor and civic organizations.”

data on monthly expenditures, funds were equally distributed between the two calendar years that compromise FY 2016-17.

### Pricing Margins

Pricing margins refer to the transaction costs associated with purchasing a good at a retail location (e.g., retailer services, wholesaler services, transportation, etc.). IMPLAN has built-in assumptions for the share of transaction costs associated with purchasing a particular good. When margins were appropriate for spending on a particular industry, we relied on IMPLAN's built-in assumptions for pricing margins.

Margins were not applicable for all program funds that went towards employee compensation because this economic activity represents a direct transfer of funds from employer to employee, without the involvement of a third-party retailer. Similarly, pricing margins were not applicable for all service related sectors modeled for this program (e.g., labor and civic organizations; printing, architectural, engineering, and related services; etc.).

### Local Purchase Percentage

The local purchase percentage refers to the share of expenditures that stay within a defined study region. Los Angeles County was defined as the study region for this research. IMPLAN already has built-in assumptions about the local purchasing patterns within each industry, so users only need to adjust this percentage when there is an exception to the norm.

Spending on employee compensation for LADWP workers was modeled with a 100% local purchase rate because all POCP staff members reside in Los Angeles County. In other words, all LADWP payroll costs were directly spent within the study area.

All of the grantees are located in Los Angeles County, so a 100% local purchase rate was assumed for all spending on labor and civic organizations. Spending on scientific research development services was also modeled with a 100% local purchase rate because this represents spending on California State University Northridge for program evaluation, statistical consultation, and other labor. The default local purchase rate was assumed for all other program expenses.

# 24. Emerging Technologies Program (ETP)

**Program Type:** Cross-cutting

**Intervention Type**: Commercial Food Appliances

**Budget in FY 2016-17:** $620,546

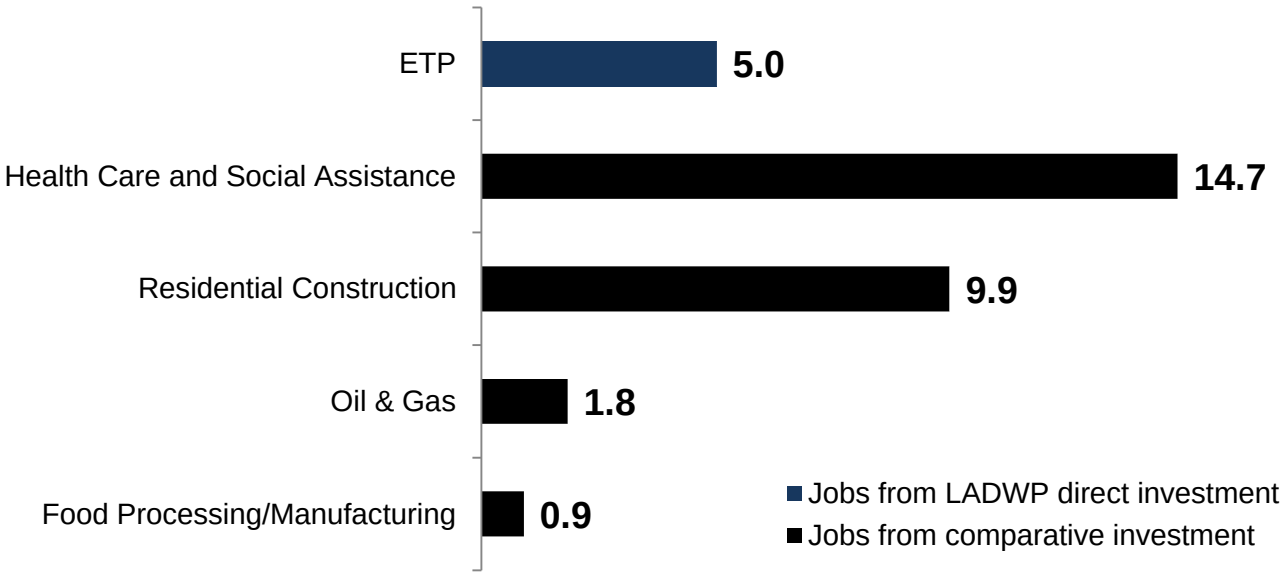
**Estimated Energy Cost Savings:** N/A

**Employment Benefits:** 3.1 Full-Time Equivalent Job-Years in Los Angeles County

**Value Added:** $585,411 in Los Angeles County

**Labor Income:** $509,704 in Los Angeles County

**Program Jobs vs. Benchmark Industries**
**(FTE Job-Years in Los Angeles County per Million Dollars of Direct Investment)**



## 24.1 Program Description

The LADWP Emerging Technologies Program (ETP) is designed to accelerate the introduction of innovative energy and water efficient technologies, applications, and analytical tools that are not yet widely adopted in California. By reducing both the performance uncertainties associated with new products, as well as institutional barriers, the ultimate goal of ETP is to increase the probability that promising energy and water efficiency technologies will be commercialized and adopted throughout Los Angeles.

ETP activities include participating on the Emerging Technologies Coordinating Council (ETCC) to assess and introduce new technologies; partnering with the Southern California Gas Company (SoCalGas), academia, and private industry on evaluation and development of emerging technologies; working with Los Angeles Cleantech Incubator (LACI) portfolio companies; and directly installing emerging technologies for evaluation and demonstration at the La Kretz Innovation Campus (LKIC) and at other LADWP facilities. These activities provide critical intelligence for updating existing rebate programs, forecasting upcoming trends, and anticipating customer requests.

## 24.2 Employment Benefits

We estimate that LADWP's direct investment in ETP during fiscal year (FY) 2016-17, totaling $620,546, is supporting **3.1** full-time equivalent (FTE) job-years in Los Angeles County (or 5.0 FTE job-years per million dollars of LADWP investment). See **Table 24.1** for a breakdown of these employment benefits by direct, indirect, and induced jobs.[176]

**Table 24.1 Direct, Indirect, and Induced Jobs Supported by ETP[177]**

| Investment Type | FTE Job-Years in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($620,546) | 1.5 | - | 1.6 | **3.1** |
| Co-investment (N/A) | - | - | - | **0** |
| Energy Cost Savings (N/A)[178] | - | - | - | **0** |
| **Total** | 1.5 | - | 1.6 | **3.1** |

[176] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced jobs.
[177] Disaggregated numbers may not add up to totals due to rounding.
[178] As a non-resource program, the energy savings accrued by this program are indirect and measured through the other LADWP resource programs analyzed in this report.

## 24.3 Economic Benefits

We estimate that LADWP's investment in ETP during FY 2016-17 added a total of **$0.6** million in value to Los Angeles County's economy. Labor income comprises 87% of the total value added. See **Tables 24.2** and **24.3** for a summary of the direct, indirect, and induced impacts of ETP on value added and labor income, respectively, in Los Angeles County.[179]

**Table 24.2 Value Added by the ETP[180]**

| Investment Type | Valued Added in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($620,546) | $411,566 | $69 | $173,776 | $585,411 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings (N/A) | - | - | - | - |
| **Total** | **$411,566** | **$69** | **$173,776** | **$585,411** |

**Table 24.3 Labor Income from ETP[181]**

| Investment Type | Labor Income in Los Angeles County | | | |
|---|---|---|---|---|
| | Direct | Indirect | Induced | Total |
| LADWP Funding in FY 2016-17 ($620,546) | $411,534 | $38 | $98,132 | $509,704 |
| Co-investment (N/A) | - | - | - | - |
| Energy Cost Savings (N/A) | - | - | - | - |
| **Total** | **$411,534** | **$38** | **$98,132** | **$509,704** |

[179] See **Chapter 2 - Methodology** for definitions of direct, indirect, and induced impacts.
[180] Disaggregated numbers may not add up to totals due to rounding.
[181] See footnote above.

## 24.4 Methodology

No detailed program data was collected or analyzed for ETP. This program represents a small share of LADWP's total investment in energy efficiency. Based on the suite of programs studied in this report, ETP comprised 0.5% of LADWP's total investment in energy efficiency for FY 2016-17. Additionally, ETP does not result in direct energy cost savings because it does not directly provide resources to LADWP customers. To allow for more attention to LADWP's larger programs and those that directly result in energy cost savings, a detailed analysis of program expenditure and timesheet data was not conducted for ETP.

In the absence of detailed program data, the economic and employment benefits reported for ETP were based on the multipliers developed for the Codes, Standards, & Ordinances (CSO) program. According to LADWP, the ETP and CSO are both research programs similar in their design and implementation costs, and should therefore have similar employment and economic impacts. CSO, however, achieves quantifiable energy cost savings, while ETP does not. Thus, the multipliers from CSO were modified to exclude the economic and employment benefits associated with energy cost savings. The methods for developing CSO's multipliers are described in **Chapter 21**.

# Appendix

## Appendix 1. Industry Baskets that Comprise Each Benchmark Industry

### Assumptions for all Benchmark Baskets

| | |
|---|---|
| Geographic Boundary | LA County |
| Timeline | 2016 and 1017 (evenly split) |
| Local Purchase Rates | Default |
| Pricing Margins | Wholesale margin and transport costs only, where applicable |

### Food Manufacturing Basket

| Industry | Total Economic Output in LA County | Weight[182] | Modeled Spending |
|---|---|---|---|
| Fluid milk manufacturing | $2,597,008,789 | 13.8% | $137,744 |
| Bread and bakery product, except frozen, manufacturing | $2,215,976,318 | 11.8% | $117,534 |
| All other food manufacturing | $1,263,705,322 | 6.7% | $67,026 |
| Animal, except poultry, slaughtering | $1,211,837,036 | 6.4% | $64,275 |
| Meat processed from carcasses | $1,045,771,851 | 5.5% | $55,467 |
| Cheese manufacturing | $798,679,199 | 4.2% | $42,361 |
| Flavoring syrup and concentrate manufacturing | $768,927,063 | 4.1% | $40,783 |
| Mayonnaise, dressing, and sauce manufacturing | $727,397,583 | 3.9% | $38,581 |
| Frozen specialties manufacturing | $722,492,737 | 3.8% | $38,321 |
| Coffee and tea manufacturing | $670,643,799 | 3.6% | $35,571 |
| Soybean and other oilseed processing | $633,282,776 | 3.4% | $33,589 |
| Canned fruits and vegetables manufacturing | $587,658,813 | 3.1% | $31,169 |
| Spice and extract manufacturing | $539,269,104 | 2.9% | $28,603 |
| Tortilla manufacturing | $453,262,299 | 2.4% | $24,041 |
| Dog and cat food manufacturing | $444,194,702 | 2.4% | $23,560 |
| Dry pasta, mixes, and dough manufacturing | $424,844,177 | 2.3% | $22,533 |
| Dry, condensed, and evaporated dairy product manufacturing | $410,113,312 | 2.2% | $21,752 |
| Other animal food manufacturing | $370,328,339 | 2.0% | $19,642 |
| Cookie and cracker manufacturing | $344,483,124 | 1.8% | $18,271 |
| Flour milling | $279,925,629 | 1.5% | $14,847 |
| Frozen fruits, juices and vegetables manufacturing | $232,596,878 | 1.2% | $12,337 |
| Confectionery manufacturing from purchased chocolate | $219,043,823 | 1.2% | $11,618 |
| Nonchocolate confectionery manufacturing | $217,938,461 | 1.2% | $11,559 |
| Other snack food manufacturing | $212,785,782 | 1.1% | $11,286 |
| Ice cream and frozen dessert manufacturing | $202,367,981 | 1.1% | $10,733 |
| Canned specialties | $182,914,322 | 1.0% | $9,702 |
| Frozen cakes and other pastries manufacturing | $159,903,183 | 0.8% | $8,481 |
| Poultry processing | $157,677,795 | 0.8% | $8,363 |
| Seafood product preparation and packaging | $141,947,662 | 0.8% | $7,529 |
| Creamery butter manufacturing | $139,424,545 | 0.7% | $7,395 |
| Fats and oils refining and blending | $129,975,723 | 0.7% | $6,894 |
| Rendering and meat byproduct processing | $103,895,226 | 0.6% | $5,511 |

[182] The basket is constructed with a list of IMPLAN Industries by using their total economic outputs in LA County as a weight. The data on the economic outputs is extracted from the 2014 IMPLAN dataset. The IMPLAN industries are selected to include all NAICS industries that fall under the category of Food Manufacturing (i.e. all industries with a 6-digit NAICS code that begins with 311).

| | | | |
|---|---|---|---|
| Rice milling | $100,290,421 | 0.5% | $5,319 |
| Roasted nuts and peanut butter manufacturing | $72,071,823 | 0.4% | $3,823 |
| Chocolate and confectionery manufacturing from cacao beans | $33,466,133 | 0.2% | $1,775 |
| Breakfast cereal manufacturing | $22,316,774 | 0.1% | $1,184 |
| Dehydrated food products manufacturing | $15,486,344 | 0.1% | $821 |
| Malt manufacturing | $- | 0.0% | $- |
| Wet corn milling | $- | 0.0% | $- |
| Beet sugar manufacturing | $- | 0.0% | $- |
| Sugar cane mills and refining | $- | 0.0% | $- |
| **Total** | **$18,853,904,848** | **13.8%** | **$1,000,000** |

### Health Care and Social Assistance Basket

| Industry | Total Economic Output In LA County | Weight[183] | Modeled Spending |
|---|---|---|---|
| Hospitals | $18,942,980,469 | 30.1% | $300,724 |
| Offices of physicians | $13,090,257,813 | 20.8% | $207,810 |
| Individual and family services | $7,060,052,734 | 11.2% | $112,080 |
| Outpatient care centers | $4,836,649,902 | 7.7% | $76,783 |
| Nursing and community care facilities | $4,255,916,504 | 6.8% | $67,564 |
| Offices of dentists | $3,814,147,949 | 6.1% | $60,550 |
| Offices of other health practitioners | $3,102,091,309 | 4.9% | $49,246 |
| Home health care services | $2,093,232,422 | 3.3% | $33,230 |
| Community food, housing, and other relief services, including rehabilitation services | $1,427,312,500 | 2.3% | $22,659 |
| Child day care services | $1,287,540,283 | 2.0% | $20,440 |
| Medical and diagnostic laboratories | $1,217,448,120 | 1.9% | $19,327 |
| Residential mental retardation, mental health, substance abuse and other facilities | $983,434,937 | 1.6% | $15,612 |
| Other ambulatory health care services | $880,281,616 | 1.4% | $13,975 |
| **Total** | **$62,991,346,558** | | **$1,000,000** |

### Oil and Gas Sector

| Industry | Weight[184] | Modeled Spending |
|---|---|---|
| Petroleum refineries | 45% | $450,000 |
| Extraction of natural gas and crude petroleum, | 23% | $230,000 |
| Natural gas distribution | 10% | $100,000 |
| All other petroleum and coal products manufacture | 8% | $80,000 |
| Drilling oil and gas wells | 7% | $70,000 |
| Support activities for oil and gas operations | 4% | $40,000 |
| Pipeline transportation | 3% | $30,000 |
| **Total** | | **$1,000,000** |

[183] The basket is constructed with a list of IMPLAN Industries by using their total economic outputs in LA County as a weight. The data on the economic outputs is extracted from the 2014 IMPLAN dataset. The IMPLAN industries are selected to include all NAICS industries that fall under the category of Health Care and Social Assistance (i.e. all industries with a 6-digit NAICS code that begins with 62).

[184] The basket is constructed according to the weights of the oil and gas basket published by the Political Economy Research Institute and the Center for American Progress in *The Economic Benefits of Investing in Clean Energy* (2009).

## Appendix 2.1 Summary of Assumptions for Modeling Household Income Levels for Customers Enrolled in Discount Rate Groups

The distribution of household income among Los Angeles County residents was assumed to mirror the distribution of income among LADWP customers who pay the standard residential rate for electricity. According to Table S1901 of the 2016 American Community Survey (1-year estimates), household income in Los Angeles County varies according to the following groupings: under $10,000 (6.4%); $10,000 to $14,999 (5.2%); $15,000 to $24,999 (9.9%); $25,000 to $34,999 (8.6%); $35,000 to $49,999 (11.9%); $50,000 to $74,999 (16.2%); $75,000 to $99,999 (11.9%), $100,000 to $150,000 (14.7%), $150,000 to $200,000 (6.6%), $200,000 and more (8.6%).

**Appendix 2.2 Composition of LADWP Discount Rates**

| Discount type | Customer Count (6/1/2017) | % of Total | Average Rate |
|---|---|---|---|
| Low Income Discount Program | 151,199 | 59.6% | $0.119 |
| Life-Support Equipment Discount | 4,570 | 1.9% | $0.106 |
| Lifeline Rate | 94,398 | 37.2% | $0.106 |
| Physician Certified Allowance Discount | 3,504 | 1.4% | $0.106 |
| **Total Customer Base on Discount Rate** | **253,671** | 100.0% | N/A |

## Appendix 2.3. Summary of Assumptions for Modeling Household Income Levels for Customers Enrolled in Discount Rate Groups

### 1. Low Income Discount Program

The maximum allowable income for customers under the Low Income Discount Program was used as a proxy for the actual income of these customers. This is a conservative assumption when modeling the spending patterns of households in IMPLAN because the spending patterns of higher income households generally have lower employment multipliers than that of lower income households. In other words, IMPLAN predicts that higher income households well spend less of their income on goods and services in the local economy, retaining more of their income as savings.

The maximum allowable income for customers under the Low Income Discount Program varies by household size. The distribution of household size among these customers was assumed to reflect the distribution of household size among Los Angeles County residents more broadly. This distribution pattern was then used to apportion the number of customers under the Low Discount Program into different maximum allowable annual groups. Those maximum allowable income groups were then matched with income groups in IMPLAN. **Table A2.1** provides a crosswalk for matching the following variables: (1) the distribution of household size among Los Angeles County residents; (2) the maximum allowable incomes set by the Low Income Discount Program; and (3) income groups in IMPLAN.

**Table A2.1. Crosswalk between Household Size and Income Groups**

| Household Size | Number of Households[185] | % of total Number of Households | Maximum Allowable Annual Gross Income for Low Income Discount Program | Relevant Income Group in IMPLAN |
|---|---|---|---|---|
| Family Households: 2 | 724,379 | 22% | $32,480 | $25 - 35k |
| Family Households: 3 | 515,830 | 16% | $40,840 | $35 - 50k |
| Family Households: 4 | 480,771 | 15% | $49,200 | $35 - 50k |
| Family Households: 5 | 261,560 | 8% | $57,560 | $50 - 75k |
| Family Households: 6 | 116,571 | 4% | $65,920 | $50 - 75k |
| Family Households: 7+ | 97,220 | 3% | $74,280 | $50 - 75k |
| Nonfamily Households: 1 | 851,587 | 26% | $32,480 | $25 - 35k |
| Nonfamily Households: 2 | 204,350 | 6% | $32,480 | $25 - 35k |
| Nonfamily Households: 3 | 35,922 | 1% | $40,840 | $35 - 50k |
| Nonfamily Households: 4 | 11,331 | 0% | $49,200 | $35 - 50k |
| Nonfamily Households: 5 | 4,294 | 0% | $57,560 | $50 - 75k |
| Nonfamily Households: 6 | 1,085 | 0% | $65,920 | $50 - 75k |
| Nonfamily Households: 7+ | 689 | 0% | $74,280 | $50 - 75k |
| **Total** | **3,305,589** | **100%** | **N/A** | **N/A** |

### 2. Lifeline Rate

[185] See Table B11016 of the 2016 American Community Survey (1-year estimates).

The combined adjusted gross income of all members of the household must be less than $36,050 in order to qualify for the Lifeline Rate (2016-17 rates). Thus, the income group of $35-50k was assumed for all customers that qualify for this rate program.

**3. Life-Support Equipment Discount / Physician Certified Allowance Discount**

The Life-Support Equipment Discount and Physician Certified Allowance Discount programs do not have income requirements. Thus, the distribution of household income among Los Angeles County residents was assumed to mirror the distribution of income among customers of these two discount programs. According to Table S1901 of the 2016 American Community Survey (1-year estimates), household income in Los Angeles County varies according to the following groupings: under $10,000 (6.4%); $10,000 to $14,999 (5.2%); $15,000 to $24,999 (9.9%); $25,000 to $34,999 (8.6%); $35,000 to $49,999 (11.9%); $50,000 to $74,999 (16.2%); $75,000 to $99,999 (11.9%), $100,000 to $150,000 (14.7%), $150,000 to $200,000 (6.6%), $200,000 and more (8.6%). These income groups match the income groups in IMPLAN, so a crosswalk was not needed to model them.

**Appendix 3.1 Summary of Inputs for Modeling EPM in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($1,217,109) | LADWP energy efficiency labor | Employee compensation | 17.13% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 0.30% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative / general expenses | Employee compensation | 14.63% | 2016-17 | N/A | 100% |
| | Outside services (Enervee) | Architectural, engineering, and related services | 22.67% | 2016-17 | N/A | 100% |
| | Incentives | Household refrigerator and home freezer manufacturing | 23.34% | 2016-17 | Default (38.71%)[a] | Default (0.02%)[b] |
| | | Automatic environmental control manufacturing | 17.44% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Air conditioning, refrigeration, and warm air heating equipment manufacturing | 2.55% | 2016-17 | Default (51.42%)[a] | Default (4.34%)[b] |
| | | Electric lamp bulb and part manufacturing | 1.25% | 2016-17 | Default (56.53%)[a] | Default (6.95%)[b] |
| | | Audio and video equipment manufacturing | 0.68% | 2016-17 | Default (50.37%)[a] | Default (0.87%)[b] |
| | | All other miscellaneous electrical equipment and component manufacturing | 0.01% | 2016-17 | Default (52.20%)[a] | Default (1.80%)[b] |
| Co-investment ($7,696,648) | Project costs | Household refrigerator and home freezer manufacturing | 86.82% | 2016-17 | Default (38.71%)[a] | Default (0.02%)[b] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Audio and video equipment manufacturing | 5.64% | 2016-17 | Default (50.37%)[a] | Default (0.87%)[b] |
| | | Automatic environmental control manufacturing | 5.32% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Air conditioning, refrigeration, and warm air heating equipment manufacturing | 2.00% | 2016-17 | Default (51.42%)[a] | Default (4.34%)[b] |
| | | Electric lamp bulb and part manufacturing | 0.21% | 2016-17 | Default (56.53%)[a] | Default (6.95%)[b] |
| Energy Cost-savings ($78,282) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage applies to the manufacturing stage of the supply chain. Default local purchase rates were also assumed for retail, wholesale, and transportation stages. For the local purchase percentages at these additional stages, contact the authors of the report.

**Appendix 4.1 Summary of Inputs for Modeling CRP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($8,198,835) | LADWP energy efficiency labor | Employee compensation | 10.02% | 2016-17 | N/A | 100% |
| | Outside services (Enervee) | Architectural, engineering, and related services | 22.67% | 2016-17 | N/A | 100% |
| | Incentives: HVAC | Air conditioning, refrigeration, and warm air heating equipment manufacturing | 2.72% | 2016-17 | Default (51.42%)[a] | Default (4.34%)[b] |
| | Incentives: Windows | Glass product manufacturing made of purchased glass | 0.85% | 2016-17 | Default (62.08%)[a] | Default (24.22%)[b] |
| | Incentives: Cool Roof | Asphalt shingle and coating materials manufacturing | 5.39% | 2016-17 | Default (60.81%)[a] | Default (96.01%)[b] |
| | Incentives: Whole House Fan | Air purification and ventilation equipment manufacturing | 0.01% | 2016-17 | Default (51.42%)[a] | Default (3.77%)[b] |
| | Incentives: Pool Pump | Pump and pumping equipment manufacturing | 46.45% | 2016-17 | Default (51.03%)[a] | Default (4.79%)[b] |
| | | Services to buildings and dwellings | 20.19% | 2016-17 | N/A | Default (92.86%) |
| | | Automatic environmental control manufacturing | 2.68% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Valve and fittings other than plumbing manufacturing | 1.36% | 2016-17 | N/A | Default (13.01%)[b] |
| | | Plastics pipe and pipe fitting manufacturing | 1.10% | 2016-17 | Default (65.03%)[a] | Default (14.95%)[b] |
| | | Wiring device manufacturing | 0.66% | 2016-17 | N/A | Default (27.93%)[b] |
| | | Retail stores - building material and garden supply | 0.54% | 2016-17 | Default (34.60%)[a] | Default (79.75%) |
| Co-investment ($35,469,456) | Project Costs: HVAC | Maintenance and repair construction of residential | 42.38% | 2016-17 | N/A | Default (73.34%) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | structures | | | | |
| | Project Costs: Windows | Glass product manufacturing made of purchased glass | 0.98% | 2016-17 | Default (62.08%)[a] | Default (24.22%)[b] |
| | | Employment and payroll only (local government, non-education) | 0.03% | 2016-17 | N/A | 100% |
| | | Maintenance and repair construction of residential structures | 2.16% | 2016-17 | N/A | Default (73.34%) |
| | | Retail stores - building material and garden supply | 0.04% | 2016-17 | Default (34.60%)[b] | Default (79.75%) |
| | Project Costs: Cool Roof | Asphalt shingle and coating materials manufacturing | 3.72% | 2016-17 | Default (60.81%)[a] | Default (96.01%)[b] |
| | | Employment and payroll only (local government, non-education) | 0.27% | 2016-17 | N/A | 100% |
| | | Maintenance and repair construction of residential structures | 19.90% | 2016-17 | N/A | Default (73.34%) |
| | Project Costs: Whole House Fan | Maintenance and repair construction of residential structures | 0.01% | 2016-17 | N/A | Default (73.34%) |
| | Project Costs: Pool Pump | Pump and pumping equipment manufacturing | 18.96% | 2016-17 | Default (51.03%)[a] | Default (4.79%)[b] |
| | | Services to buildings and dwellings | 8.77% | 2016-17 | N/A | Default (92.86%) |
| | | Automatic environmental control manufacturing | 1.56% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Valve and fittings other than plumbing manufacturing | 0.53% | 2016-17 | N/A | Default (13.01%)[b] |
| | | Plastics pipe and pipe fitting manufacturing | 0.31% | 2016-17 | Default (65.03%)[a] | Default (14.95%)[b] |
| | | Wiring device manufacturing | 0.19% | 2016-17 | N/A | Default (27.93%)[b] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Retail stores - building material and garden supply | 0.21% | 2016-17 | Default (34.60%)[a] | Default (79.75%) |
| Energy Cost-Savings ($1,654,578) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage applies to the manufacturing stage of the supply chain. Default local purchase rates were also assumed for retail, wholesale, and transportation stages. For the local purchase percentages at these additional stages, contact the authors of the report.

**Appendix 5.1 Summary of Inputs for Modeling HEIP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($8,999,942) | LADWP energy efficiency and PCM labor | Employee compensation | 45.75% | 2016-17 | N/A | 81.09% |
| | Services provided by other LADWP departments* | Employee compensation | 7.47% | 2016-17 | N/A | 81.09% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 34.93% | 2016-17 | N/A | 81.09% |
| | Outside services | Printing | 0.61% | 2016-17 | N/A | Default (17.82%) |
| | Materials | Pottery, ceramics, and plumbing fixture manufacturing | 2.25% | 2016-17 | Default (66.27%)[a] | Default (1.57%)[b] |
| | | Other communications equipment manufacturing | 2.03% | 2016-17 | Default (52.17%)[a] | Default (8.20%)[b] |
| | | Air conditioning, refrigeration, and warm air heating equipment manufacturing | 1.60% | 2016-17 | Default (51.42%)[a] | Default (4.34%)[b] |
| | | Semiconductor and related device manufacturing | 1.58% | 2016-17 | Default (44.88%)[a] | Default (4.43%)[b] |
| | | Electric lamp bulb and part manufacturing | 1.54% | 2016-17 | Default (56.53%)[a] | Default (6.95%)[b] |
| | | Mineral wool manufacturing | 0.62% | 2016-17 | Default (48.33%)[a] | Default (0.20%)[b] |
| | | Employment and payroll only (local government non-education) | 0.50% | 2016-17 | N/A | 100% |
| | | Retail Stores - Building material and garden supply | 0.42% | 2016-17 | Default (34.60%)[a] | 100% |
| | | Plumbing fixture fitting and trim manufacturing | 0.36% | 2016-17 | Default (49.9%)[a] | Default (3.75%)[b] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Air purification and ventilation equipment manufacturing | 0.23% | 2016-17 | Default (51.42%)[a] | Default (3.77%)[b] |
| | | Lighting fixture manufacturing | 0.08% | 2016-17 | Default (63.29%)[a] | Default (6.27%)[b] |
| | | Adhesive manufacturing | 0.01% | 2016-17 | Default (56.74%)[a] | Default (24.77%)[b] |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($736,334) | Residential | Household Income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency and PCM labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage only applies to the manufacturing stage of the supply chain. A local purchase rate of 100% was assumed for the retail stage and the default local purchase rate was assumed for the wholesale and transportation stages.

**Appendix 6.1 Summary of Inputs for Modeling REP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($3,466,223) | LADWP energy efficiency labor | Employee compensation | 4.08% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 0.06% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 3.52% | 2016-17 | N/A | 100% |
| | Outside services (ARCA) | Household refrigerator and home freezer manufacturing | 81.08% | 2016-17 | Default (38.71%)[a] | 0%[b] |
| | | Waste management and remediation services | 11.25% | 2016-17 | N/A | 100% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($395,376) | Residential | Household Income | 95% | 2016-17 | N/A | 100% |
| | Commercial | Proprietor Income | 5% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage applies to the manufacturing stage of the supply chain. Default local purchase rates were also assumed for retail, wholesale, and transportation stages. For the local purchase percentages at these additional stages, contact the authors of the report.

**Appendix 7.1 Summary of Inputs for Modeling RETIRE in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($429,474) | LADWP energy efficiency labor | Employee compensation | 8.27% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 0.04% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 7.12% | 2016-17 | N/A | 100% |
| | Outside services (Enervee) | Household income | 9.33% | 2016-17 | N/A | 100% |
| | | Architectural, engineering, and related services | 0.26% | 2016-17 | N/A | 100% |
| | Outside services (ARCA) | Waste management and remediation services | 74.98% | 2016-17 | N/A | 100% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($1,342,713) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency was assumed.

**Appendix 8.1 Summary of Inputs for Modeling ACOP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($2,856,824) | LADWP energy efficiency labor | Employee compensation | 6.89% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 7.87% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 5.95% | 2016-17 | N/A | 100% |
| | Outside services (CLEAResult) | Automatic environmental control manufacturing | 34.39% | 2016-17 | No | 0% |
| | | Management consulting services | 23.55% | 2016-17 | N/A | 100% |
| | | Maintenance and repair construction of residential buildings | 18.08% | 2016-17 | N/A | Default (73.34%) |
| | | Maintenance and repair construction of nonresidential buildings | 3.19% | 2016-17 | N/A | Default (75.14%) |
| | Materials | Retail - building material and garden supply | 0.07% | 2016-17 | Default (34.60%)[a] | 100% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($1,025,357) | Residential | Household Income | 85.41% | 2016-17 | N/A | 100% |
| | Commercial | Proprietor Income | 14.59% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

**Appendix 9.1 Summary of Inputs for Modeling RLEP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($18,725,769) | LADWP energy efficiency labor | Employee compensation | 0.63% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 2.28% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 0.54% | 2016-17 | N/A | 100% |
| | Outside services (AM Conservation) | Management Consulting Services | 4.87% | 2016-17 | N/A | 0% |
| | | Semiconductor and related device manufacturing | 54.06% | 2016-17 | No | 0% |
| | | Textile bags and canvas mills | 3.49% | 2016-17 | No | 0% |
| | | Printing | 0.58% | 2016-17 | N/A | 0% |
| | Materials | Semiconductor and related device manufacturing | 33.55% | 2016-17 | No | 0% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($7,644,367) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 10.1 Summary of Inputs for Modeling ESAP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($577,000) | LADWP energy efficiency labor | Employee compensation | 0.98% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | N/A | N/A | N/A | N/A | N/A |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 0.85% | 2016-17 | N/A | 100% |
| | Outside services (SoCalGas) | Employee compensation | 9.78% | 2016-17 | N/A | 25.64% |
| | | Maintenance and repair construction of residential structures | 88.27% | 2016-17 | N/A | 100% |
| | | Printing | 0.10% | 2016-17 | N/A | Default (17.82%) |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($204,543) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 11.1 Summary of Inputs for Modeling HU EUC in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($956,938) | LADWP energy efficiency labor | Employee compensation | 1.26% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | N/A | N/A | N/A | N/A | N/A |
| | LADWP employee benefits and administrative / general expenses | Employee compensation | 1.03% | 2016-17 | N/A | 100% |
| | Outside services (SoCalGas) | Employee compensation | 2.19% | 2016-17 | N/A | 100% |
| | Incentives | Maintenance and repair construction of residential structures | 95.52% | 2016-17 | N/A | Default (73.34%) |
| Co-investment ($6,623,318) | Project costs | Maintenance and repair construction of residential | 100% | 2016-17 | N/A | Default (73.34%) |
| Energy Cost-savings ($123,611) | Residential | Household income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 12.1 Summary of Inputs for Modeling CLIP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($8,159,637) | LADWP energy efficiency labor | Employee compensation | 23.49% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 0.04% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 18.93% | 2016-17 | N/A | 100% |
| | Outside services | Management consulting services | 0.52% | 2016-17 | N/A | Default (80.41%) |
| | Incentives | Semiconductor and related device manufacturing | 34.30% | 2016-17 | Default (44.88%)[a] | Default (4.43%)[b] |
| | | Maintenance and repair construction of nonresidential structures | 19.25% | 2016-17 | N/A | Default (75.14%) |
| | | Power, distribution, and specialty transformer manufacturing | 2.11% | 2016-17 | Default (41.01%)[a] | Default (3.31%)[b] |
| | | Architecture, engineering, and related services | 0.82% | 2016-17 | N/A | Default (95.59%) |
| | | Waste management and remediation services | 0.39% | 2016-17 | N/A | Default (93.67%) |
| | | Electric lamp bulb and part manufacturing | 0.08% | 2016-17 | Default (56.53%)[a] | Default (6.95%)[b] |
| | | Commercial and industrial machinery and equipment rental and leasing | 0.05% | 2016-17 | N/A | Default (99.10%) |
| | | US Postal Service | 0.02% | 2016-17 | N/A | Default (85.08%) |
| Co-Investment ($1,013,895) | Project costs | Semiconductor and related device manufacturing | 49.12% | 2016-17 | Default (44.88%)[a] | Default (4.43%)[b] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Power, distribution, and specialty transformer manufacturing | 25.94% | 2016-17 | Default (41.01%)[a] | Default (3.31%)[b] |
| | | Maintenance and repair construction of nonresidential structures | 24.31% | 2016-17 | N/A | Default (75.14%) |
| | | Waste management and remediation services | 0.50% | 2016-17 | N/A | Default (93.67%) |
| | | Commercial and industrial machinery and equipment rental and leasing | 0.13% | 2016-17 | N/A | Default (99.10%) |
| Energy Cost-Savings ($4,855,497) | Commercial | Proprietor income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage only applies to the manufacturing stage of the supply chain. A local purchase rate of 100% was assumed for the retail stage and the default local purchase rate was assumed for the wholesale and transportation stages. For the local purchase percentages at these additional stages, contact the authors of the report.

**Appendix 13.4 Summary of Inputs for Modeling CPP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($8,334,517) | LADWP energy efficiency labor | Employee compensation | 15.94% | 2016-17 | N/A | 46.15% |
| | Services provided by other LADWP departments* | Employee compensation | 0.09% | 2016-17 | N/A | 46.15% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 12.64% | 2016-17 | N/A | 46.15% |
| | Engineering support services | Employee compensation | 4.69% | 2016-17 | N/A | 87.23% |
| | Incentives | Automatic environmental control manufacturing | 49.75% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Maintenance and repair construction of nonresidential structures | 16.15% | 2016-17 | N/A | Default (75.14%) |
| | | US postal service | 0.43% | 2016-17 | N/A | Default (85.08%) |
| | | Retail stores - building material and garden supply | 0.31% | 2016-17 | N/A | Default (79.75%) |
| Co-investment ($1,851,321) | Incentives | Automatic environmental control manufacturing | 74.7% | 2016-17 | Default (54.69%)[a] | Default (0.61%)[b] |
| | | Maintenance and repair construction of nonresidential structures | 24.2% | 2016-17 | N/A | Default (75.14%) |
| | | Retail stores - building material and garden supply | 0.5% | 2016-17 | N/A | Default (79.75%) |
| | | US postal service | 0.7% | 2016-17 | N/A | Default (85.08%) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Energy Cost-savings ($4,969,891) | Commercial | Proprietor income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage applies to the manufacturing stage of the supply chain. Default local purchase rates were also assumed for retail, wholesale, and transportation stages. For the local purchase percentages at these additional stages, contact the authors of the report.

**Appendix 14.1 Summary of Inputs for Modeling SBD in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($3,845,587) | LADWP energy efficiency labor | Employee compensation | 0.79% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | N/A | N/A | N/A | N/A | N/A |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 0.65% | 2016-17 | N/A | 100% |
| | Outside services (SoCalGas) | Employee compensation | 1.57% | 2016-17 | N/A | 80% |
| | Outside services: (Okapi) | Employee compensation | 24.20% | 2016-17 | N/A | 100% |
| | Incentives | Construction of new commercial structures | 72.79% | 2016-17 | N/A | Default (100%) |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-Savings ($1,038,018) | Commercial | Proprietor income | 100% | 2016-17 | Varies | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 15.1 Summary of Inputs for Modeling Upstream HVAC in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($3,064,300) | LADWP energy efficiency labor | Employee compensation | 0.35% | 2016-17 | N/A | 37.31% |
| | Services provided by other LADWP departments* | N/A | N/A | N/A | N/A | N/A |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 0.28% | 2016-17 | N/A | 37.31% |
| | Outside services (Energy Solutions) | Architecture, engineering and related services | 11.68% | 2016-17 | N/A | 43.86% |
| | Incentives | Wholesale trade | 87.69% | 2016-17 | N/A | 40% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($10,374,531) | Commercial | Proprietor income | 90% | 2016-17 | N/A | 100% |
| | Institutional | Elementary and secondary schools | 8.94% | 2016-17 | N/A | 100% |
| | | Junior colleges, colleges, universities, and professional schools | 0.44% | 2016-17 | N/A | 100% |
| | | Other local government enterprises | 0.62% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 16.1 Summary of Inputs for Modeling CAHP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($2,710,211) | LADWP energy efficiency labor | Employee compensation | 0.38% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | N/A | N/A | N/A | N/A | N/A |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 0.30% | 2016-17 | N/A | 100% |
| | Outside services (SoCal Gas) | Employee compensation | 6.34% | 2016-17 | N/A | 50% |
| | Materials | N/A | N/A | N/A | N/A | N/A |
| | Incentives | Construction of new single-family residential structures | 3.09% | 2016-17 | N/A | Default (100%) |
| | | Construction of new multi-family residential structures | 89.89% | 2016-17 | N/A | Default (99.94%) |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-Savings ($341,546) | Residential | Household income | 100% | 2016-17 | Varies | 100% |

*****These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**Appendix 17.1 Summary of Inputs for Modeling LAUSD DI in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($721,640) | LADWP energy efficiency and PCM labor | Employee compensation | 58.99% | 2016-17 | N/A | 79.53% |
| | Services provided by other LADWP departments* | Employee compensation | 0.79% | N/A | N/A | 79.53% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation / | 28.68% | 2016-17 | N/A | 79.53% |
| | Outside services (LAUSD) | Employment and payroll only (local government, education) | 2.41% | 2016-17 | N/A | 100% |
| | Materials | Retail stores - building material and garden supply | 9.13% | 2016-17 | Default (34.60%)[a] | 100% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($575,017) | Institutional | Employment and payroll only (local government, education) | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency and PCM labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

**Appendix 18.1 Summary of Inputs for Modeling CDI in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($42,643,955) | LADWP energy efficiency and PCM labor | Employee compensation | 2.43% | 2016-17 | N/A | 79.53% |
| | Services provided by other LADWP departments* | Employee compensation | 0.61% | 2016-17 | N/A | 79.53% |
| | LADWP employee benefits and administrative/ general expenses* | Employee compensation | 1.23% | 2016-17 | N/A | 79.53% |
| | Outside services (Lime Energy and subcontractors) | Maintenance and repair construction of nonresidential structures | 89.79% | 2016-17 | N/A | 100% |
| | | Employment and payroll only (local government, non-education) | 2.53% | 2016-17 | N/A | Default (100%) |
| | | Commercial and industrial machinery and equipment rental and leasing | 1.55% | 2016-17 | N/A | Default (99.10%) |
| | | Civic and labor organizations | 1.07% | 2016-17 | N/A | 100% |
| | | Software publishers | 0.39% | 2016-17 | N/A | Default (79.10%) |
| | | Wireless tele-communications carrier (except satellite) | 0.07% | 2016-17 | N/A | Default (70.64%) |
| | Materials | Pottery, ceramics, and plumbing fixture manufacturing | 0.31% | 2016-17 | Default (66.27%)[a] | Default (1.57%)[b] |
| | | Mineral wool manufacturing | 0.02% | 2016-17 | Default (48.33%)[a] | Default (0.20%)[b] |
| | | Plumbing fixture fitting and trim manufacturing | 0.01% | 2016-17 | Default (49.90%)[a] | Default (3.75%)[b] |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Energy Cost-savings ($10,838,167) | Commercial | Proprietor income | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency and PCM labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage only applies to the manufacturing stage of the supply chain. A local purchase rate of 100% was assumed for the retail stage and the default local purchase rate was assumed for the wholesale and transportation stages.

**Appendix 19.1 Summary of Inputs for Modeling the Food Service Program**

*This program was not modeled in IMPLAN. The economic and employment benefits reported for the Food Service Program were based on the multipliers developed for the Commercial Lighting Incentive Program (CLIP). According to LADWP, the Food Service Program and CLIP are both commercial rebate programs that are closely matched in terms of their design and implementation, and should therefore have similar employment and economic impacts from each dollar of direct investment. Likewise, both programs are assumed to generate similar levels of co-investment per dollar of direct investment. CLIP, however, generates three times as many kilowatt hour (kWh) savings as the Food Service Program per dollar of direct investment. Thus, the multipliers from CLIP were modified to reflect the energy cost savings that one would expect for the Food Service Program, based on FY 2016-17 estimates. The methods for developing CLIP's multipliers are described in* ***Chapter 12****.*

**Appendix 20.1 Summary of Inputs for Modeling City Plants in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($2,280,000) | LADWP energy efficiency labor | Employee compensation | 1.43% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 1.19% | 2016-17 | N/A | 100% |
| | Outside services (LACC and other local non-profits) | Labor and civic organizations | 62.92% | 2016-17 | N/A | 100% |
| | | Greenhouse, nursery, and floriculture production | 19.43% | 2016-17 | No | 44% |
| | | Maintenance and repair construction of highways, streets, bridges and tunnels | 6.18% | 2016-17 | N/A | 100% |
| | | Retail – building material and garden supply | 3.94% | 2016-17 | Default (34.60%)[c] | 100% |
| | | Mileage basket[*] | 2.51% | 2016-17 | Varies[a] | Varies[c] |
| | | Paperboard container manufacturing | 0.66% | 2016-17 | Default (37.24%)[b] | 0% |
| | | Custom computer programming services | 0.64% | 2016-17 | N/A | 0% |
| | | Printing | 0.54% | 2016-17 | N/A | Default (17.82%) |
| | | Advertising and related services | 0.54% | 2016-17 | N/A | 100% |
| Co-investment ($315,000) | Non-profit operations (City Plants) | Employee compensation | 88.25% | 2016-17 | N/A | 73.33% |
| | | All other materials and services[**] | 11.75% | 2016-17 | Varies | Varies |
| Energy Savings ($1,528,101) | Commercial | Proprietor income | 10% | 2016-17 | N/A | 100% |
| | Residential | Household income | 90% | 2016-17 | N/A | 100% |

[*] The mileage basket is a mix of industries, as based on the average breakdown of annual vehicle costs reported in the American Automobile Association's 2015 Your Driving Costs study. The mix of industries included in the basket include: household income (42%), retail stores – gasoline stations (19.3%), insurance carriers (12.8%), automotive repair and maintenance, except car washes (8.8%), monetary authorities and depositor credit intermediation activities (7.7%), employment and payroll only (state and local government, non-education) (7.7%), and tire manufacturing (1.7%). Household income is a unique industry in the basket because it does not directly correspond to a vehicle cost, and instead represents reimbursement dollars that go towards vehicle depreciation, which drivers may spend in a variety of ways. Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of the reimbursed drivers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions

[**] See **Appendix 20.2** for a full list.

[a] Pricing margins for the mileage basket vary because they represent seven different industrial sectors. Margins were only applicable for retail stores – gasoline stations and tire manufacturing. The default rate for transaction costs was assumed for both industries (11.6% and 58.1%, respectively).

[b] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[c] The default local purchase rate for the mileage basket varies because it represents seven different industrial sectors. The default local purchase rate in IMPLAN was assumed for all seven industries in the basket (household income was 100%; retail stores – gasoline stations was 75.0%; insurance carriers was 48.8%; automotive repair and maintenance, except car washes was 99.9%; monetary authorities and depositor credit intermediation activities was 91.3%; employment and payroll only (state and local government, non-education) was 100%; and tire manufacturing was 4%).

**Appendix 20.2 Inputs for Modeling "All Other Materials and Services" for City Plants**

| IMPLAN Industry | Percent of Total | Default Margins | Default Local Purchase Rate |
|---|---|---|---|
| Food services and drinking places | 25.3% | N/A | 99.99% |
| Other support services | 9.8% | N/A | 98.03% |
| Labor and civic organizations | 8.8% | N/A | 99.99% |
| Specialized design services | 8.7% | N/A | 99.36% |
| Transport by Air | 7.1% | N/A | 78.20% |
| Real estate establishments | 6.5% | N/A | 99.74% |
| Retail Stores - Building material and garden supply | 6.3% | N/A | 79.75% |
| Retail Stores - Miscellaneous | 4.8% | N/A | 99.96% |
| Hotels and motels, including casino hotels | 4.3% | N/A | 5.00% |
| Office supplies (except paper) manufacturing | 4.1% | 63.03%[a] | 1.09% |
| Internet publishing and broadcasting | 3.7% | N/A | 94.73% |
| Data processing, hosting, ISP, web search portals and related services | 2.2% | N/A | 72.20% |
| Printing | 1.9% | N/A | 17.82% |
| Retail - Gasoline stores | 1.5% | N/A | 74.98% |
| Automotive equipment rental and leasing | 1.4% | N/A | 72.18% |
| US Postal Service | 1.3% | N/A | 85.08% |
| Insurance carriers | 1.0% | N/A | 47.97% |
| Software publishers | 0.5% | N/A | 79.10% |
| Business support services | 0.3% | N/A | 63.66% |
| Retail Stores - Electronics and appliances | 0.3% | N/A | 99.84% |
| **Total** | **100%** | **N/A** | **N/A** |

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

**Appendix 21.1 Summary of Inputs for Modeling CSO in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($624,106) | LADWP energy efficiency labor | Employee compensation | 35.11% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 2.28% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 28.28% | 2016-17 | N/A | 100% |
| | Outside services (PG&E) | Employee compensation | 33.14% | 2016-17 | N/A | 0% |
| | Outside services (SoCalGas) | Employee compensation | 0.63% | 2016-17 | N/A | 50% |
| | Outside services (Building Media) | Motion picture and video industries | 0.49% | 2016-17 | N/A | 0% |
| | Materials | Retail – miscellaneous store retailers | 0.11% | 2016-17 | Default (53.20%)[a] | 100% |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-Savings ($27,126,832) | Commercial | Proprietor income | 40% | 2016-17 | N/A | 100% |
| | Residential | Household income | 60% | 2016-17 | N/A | 100% |

*****These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

**Appendix 22.1 Summary of Inputs for Modeling LADWP Facilities Upgrade in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($2,652,549) | LADWP energy efficiency and PCM labor | Employee compensation | 39.39% | 2016-17 | N/A | 54.08% |
| | Services provided by other LADWP departments* | Employee compensation | 5.05% | 2016-17 | N/A | 54.08% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 28.75% | 2016-17 | N/A | 54.08% |
| | Outside services** | N/A | 0.05% | N/A | N/A | N/A |
| | Materials: indoor / outdoor LED lighting | Semiconductor and related device manufacturing | 25.15% | 2016-17 | Default (44.88%)[a] | 0.28%[b] |
| | Materials: miscellaneous products | Lighting fixture manufacturing | 1.61% | 2016-17 | Default (31.02%)[a] | 0%[c] |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings ($168,955) | LADWP Inter-departmental | Local government electric utilities | 100% | 2016-17 | N/A | 100% |

*These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency and PCM labor was assumed.

** Funds spent on outside services were negligible and were excluded from the model.

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] This percentage only applies to the manufacturing stage of the supply chain. A local purchase rate of 97.49% was assumed for the retail stage (as based on supplier data) and the default local purchase rate was assumed for the wholesale and transportation stages.

[c] This percentage only applies to the manufacturing stage of the supply chain. A local purchase rate of 21.62% was assumed for the retail stage (as based on supplier data) and the default local purchase rate was assumed for the wholesale and transportation stages.

**Appendix 23.1 Summary of Inputs for Modeling POCP in IMPLAN**

| Investment Type | Cost Category | IMPLAN Industry | Share Of Total Funds | Spending Timeline | Margins | Local Purchase Rate |
|---|---|---|---|---|---|---|
| LADWP FY 2016-17 Funding ($1,696,000) | LADWP energy efficiency labor | Employee compensation | 10.40% | 2016-17 | N/A | 100% |
| | Services provided by other LADWP departments* | Employee compensation | 0.66% | 2016-17 | N/A | 100% |
| | LADWP employee benefits and administrative/ general expenses | Employee compensation | 8.97% | 2016-17 | N/A | 100% |
| | Outside services | Labor and civic organizations | 58.2% | 2016-17 | N/A | Default (100%) |
| | | All other materials and services** | 21.7% | 2016-17 | Varies | Default (Varies) |
| Co-investment (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |
| Energy Cost-savings (N/A) | N/A | N/A | N/A | N/A | N/A | N/A |

***These services may include fleet services, records management, facilities maintenance, mechanical repair services, postal services, permitting services, and landscape services. Without detailed knowledge of the place of residence, hours worked, and salaries of all the supporting LADWP staff members who bill to this cost category, the local purchase rate for LADWP energy efficiency labor was assumed.

**See **Appendix 23.2** for a full list.

**Appendix 23.2 Inputs for Modeling "All Other Materials and Services" for POCP**

| IMPLAN Industry | Percent of Total | Default Margins | Local Purchase Rate | |
|---|---|---|---|---|
| | | | Method | Rate (%) |
| Printing | 18.55% | N/A | Default | 17.82% |
| Architectural, engineering, and related services | 12.81% | N/A | Default | 95.59% |
| Automotive equipment rental and leasing | 8.99% | N/A | Default | 72.18% |
| Household income* | 8.56% | N/A | Custom | 100% |
| Management and consulting services | 8.14% | N/A | Default | 80.41% |
| Scientific research and development services | 7.27% | N/A | Custom | 100% |
| Retail stores - building material and garden supply | 7.03% | N/A | Default | 79.75% |
| Computer systems design services | 5.84% | N/A | Default | 45.45% |
| Real estate establishments | 5.80% | N/A | Default | 99.74% |
| Retail Stores - Food and beverage | 2.89% | N/A | Default | 99.94% |
| Advertising and related services | 2.59% | N/A | Default | 98.27% |
| Photographic services | 2.56% | N/A | Default | 99.82% |
| Maintenance and repair construction of nonresidential structures | 1.61% | N/A | Default | 75.14% |
| Software Publishers | 1.52% | N/A | Default | 79.10% |
| Semiconductor and related device manufacturing | 1.19% | 45%[a] | Default | 4.43% |
| Other private educational services | 1.13% | N/A | Default | 99.92% |
| Telecommunications | 0.90% | N/A | Default | 70.64% |
| Specialized design services | 0.90% | N/A | Default | 99.36% |
| Retail Stores - Gasoline stations | 0.54% | N/A | Default | 74.96% |
| Mileage basket** | 0.43% | Varies[b] | Default | Varies[c] |
| Office supplies (except paper) manufacturing | 0.37% | 63%[a] | Default | 1.09% |
| Electric Lamp Bulb and Part Manufacturing | 0.26% | 57%[a] | Default | 6.95% |
| Retail Stores - Electronics and appliances | 0.10% | N/A | Default | 99.84% |
| **Total** | **100%** | **N/A** | **N/A** | **N/A** |

*Household income represents spending on incentives for program participation (e.g., gift cards) as well as stipends for teachers participating in trainings and curriculum development on energy efficiency. Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of program beneficiaries, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions

**The mileage basket is a mix of industries, as based on the average breakdown of annual vehicle costs reported in the American Automobile Association's 2015 Your Driving Costs study. The mix of industries included in the basket include: household income (42%), retail stores – gasoline stations (19.3%), insurance carriers (12.8%), automotive repair and maintenance, except car washes (8.8%), monetary authorities and depositor credit intermediation activities (7.7%), employment and payroll only (state and local government, non-education) (7.7%), and tire manufacturing (1.7%). Household income is a unique industry in the basket because it does not directly correspond to a vehicle cost, and instead represents reimbursement dollars that go towards vehicle depreciation, which drivers may spend in a variety of ways.

Since spending patterns of households vary by income, IMPLAN allows users to build in assumptions about the income levels of impacted households. Without detailed data on the household size and income levels of the reimbursed drivers, a number of assumptions had to be made and entered into IMPLAN. See **Appendix 2.1** for a summary of these assumptions

[a] This percentage represents the share of spending within an industry that goes to transaction costs (i.e., retailer services, wholesaler services, and transportation services).

[b] Pricing margins for the mileage basket vary because they represent seven different industrial sectors. Margins were only applicable for retail stores – gasoline stations and tire manufacturing. The default rate for transaction costs was assumed for both industries (11.6% and 581%, respectively).

[c] The default local purchase rate for the mileage basket varies because it represents seven different industrial sectors. The default local purchase rate in IMPLAN was assumed for all seven industries in the basket (household income was 100%; retail stores – gasoline stations was 75.0%; insurance carriers was 48.8%; automotive repair and maintenance, except car washes was 99.9%; monetary authorities and depositor credit intermediation activities was 91.3%; employment and payroll only (state and local government, non-education) was 100%; and tire manufacturing was 4%).

**Appendix 24.1 Summary of Inputs for Modeling the Emerging Technologies Program**

*This program was not modeled in IMPLAN. The economic and employment benefits reported for the Emerging Technologies Program (ETP) were based on the multipliers developed for the Codes, Standards & Ordinances (CSO) program. According to LADWP, the ETP and CSO are both research programs that are closely matched in terms of their design and implementation, and should therefore have similar employment and economic impacts from each dollar of direct investment. CSO, however, achieves quantifiable energy cost-savings, while ETP does not. Thus, the multipliers from CSO were modified to exclude the economic and employment benefits associated with energy cost-savings. The methods for developing CSO's multipliers are described in* ***Chapter 21****.*

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