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Los Angeles Department of Water & Power

Efficiently Energizing Job Creation in Los Angeles

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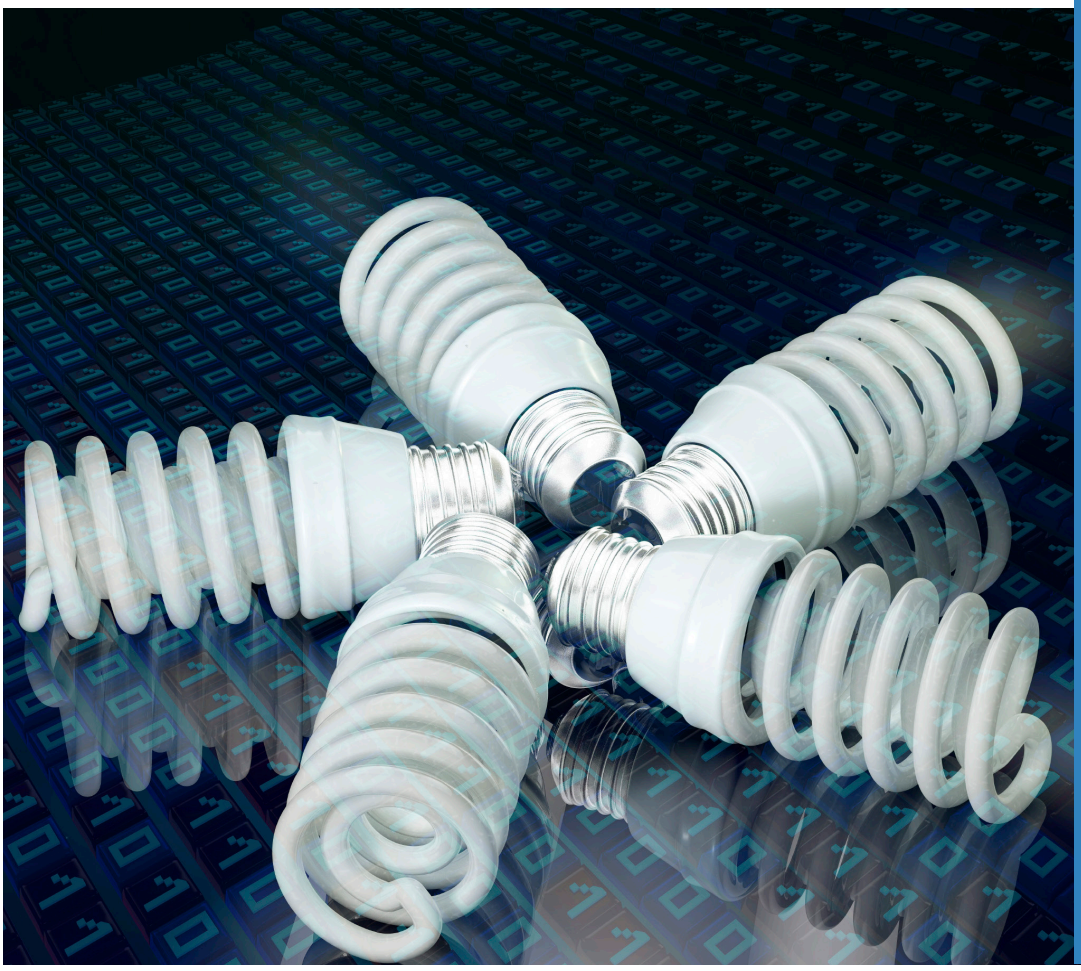

Efficiently Energizing Job Creation in Los Angeles: Economic Development Benefits of LADWP's Energy Efficiency Programs

ABSTRACT

This report seeks to estimate the magnitude of job-creation benefits for 18 energy efficiency programs administered by the Los Angeles Department of Water and Power (LADWP) in 2014. The study finds the job-creation benefits for these programs are large in both absolute and relative terms, especially when compared to other energy sector investments. Not only are these programs local job creators, but they are also benefiting a diverse set of LADWP customers in energy and economic savings.

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DISCLAIMER

The UCLA Luskin Center appreciates the contributions of the aforementioned individuals and their agencies and organizations. This document, however, does not necessarily reflect their views or anyone else other than those of the authors. Anyone other than the authors make no claims regarding the accuracy or completeness of the information in this report. Any errors are the responsibility of the primary authors.

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1.1 Introduction

In this study, we estimate the magnitude of the job-creation benefits for the largest 18 energy efficiency programs administered by the Los Angeles Department of Water and Power (LADWP) in 2014.[1] Policymakers often overlook these job-creation benefits because they are difficult to calculate for the local job market. Instead, they emphasize other energy efficiency benefits such as customer cost-savings, the reduced need to build future electricity generation and transmission, and reduced air pollution emissions, including greenhouse gases. These are all important benefits, but the concurrent local job creation and economic development impacts must also be fully considered in any holistic accounting of total benefits accrued due to policymakers' decisions to invest in local and regional energy efficiency efforts.

Accordingly, this study finds the job-creation benefits of these LADWP programs are large in both absolute and relative terms. Compared to other energy sector investments such as solar, natural gas, and smart grid infrastructure, energy efficiency produces the largest number of job-years per public dollar invested. The average program job-creation impacts are greater than the residential new-construction sector as well. These programs serve a diverse set of LADWP customers, benefiting large and small businesses, public schools and residents. Finally, these programs stimulate job creation at every rung on the jobs-skill ladder and impact most trades at various skill levels.

1.1.1 Large relative and absolute impacts

While the energy efficiency programs ranged considerably, from 5.7 to 39 job-years per million dollars invested, the weighted-average across all LADWP energy efficiency programs was 16 job-years created per million dollars of direct investment by LADWP. This compares favorably to investment in residential construction, an often cited source of local employment growth,

1 Two additional programs accounting for 1.6% of the LADWP energy efficiency portfolio budget fall outside the bounds of the types of programs examined in this study and are omitted.

which creates 10.7 job-years per million dollars invested.[2] Energy efficiency investments also compare favorably to other energy-related investments such as natural gas, smart grid and solar generation, which generate 5.2, 12.5 and 13.7 job-years per million dollars invested respectively.[3]

The assumed energy efficiency budget for LADWP energy efficiency in 2013-2014 provided for $108 million of direct investment in these programs. We calculate that this level of expenditure will lead to the creation of over 1,746 local job-years. Projecting out to the year 2020 at this level of investment, this amounts to over 17,385 job-years created. This is true even after accounting for a) expected increases in labor productivity (which reduce the job-creation impacts) and b) anticipated reductions in the cost-savings of future energy efficient investments (because early participants enjoy greater cumulative savings than do later participants).

1.1.2 Cost-savings, co-investments and public incentives re-invested in our local economy

Energy efficiency investments have large local employment creation impacts, in part because they offer large cost-savings to local customers. Like renewable energy projects, energy efficiency projects often leverage significant co-investments from local businesses, schools and households. Both types of programs may also leverage some state and federal incentives. However, the potential cost-savings of energy efficiency investments tends to be much larger than that of other clean energy programs, leaving business, schools and households with relatively more money to spend in the local economy. The Custom Performance Program (CPP), an incentive-based retrofit program for commercial buildings, is a good example of this. Customers can easily achieve 50% energy savings on certain interventions, like variable speed drives, that can pay back in just a handful of years or less.[4]

Another significant reason that energy efficiency programs have relatively larger local employment impacts than other energy projects is that a greater share of both the labor and materials are sourced regionally. Even for those materials that are manufactured elsewhere, these materials are purchased locally, which means the locally marked-up price in part supports local business operations. A good illustration of this is the Small Business Direct Install (SBDI) program. It is a labor-intensive direct install program that primarily draws labor from the International Brotherhood of Electric Workers (IBEW) union, and according to LADWP procurement policy, must purchase materials locally.

1.1.3 Benefits to a diversity of customers

LADWP's energy efficiency programs support a wide array of customer types. These programs target small and large businesses, public schools and residential customers including low-income households, seniors, disabled customers and multi-family housing. Because of its diverse

2 Source: IMPLAN, 2012 Los Angeles County dataset.

3 Source: Pollin, Heintz, & Garrett-Peltier, "The Economic Benefits of Investing in Clean Energy", 2009, University of Massachusetts, Amherst, Political Economy Research Institute.

4 VFDs or variable speed drives can be used in HVAC systems and exhaust and extraction systems.

customer focus, LADWP's energy efficiency projects are potentially its most geographically inclusive program of all clean energy programs, reaching every corner of the city.

1.1.4 Benefits for a range of job skills and trades

These programs target a range of energy and water technologies including lighting, heating and air conditioning, roofs, refrigeration, windows, insulation, etc. These technologies may be embedded in new construction or retrofitted into existing buildings. As a result, these programs stimulate job creation for a wide range of trades, including electricians, metal workers, roofers, carpentry, plumbing and a suite of related construction trades. Job creation reaches far beyond the utility. While some programs create predominantly high skilled jobs (e.g., the Energy Efficiency Technical Assistance Program or the Codes, Standards and Ordinances Program) or lower skilled jobs (e.g., City Plants), most of LADWP's programs support a mix of entry to high-skilled jobs. Out of all LADWP programs, the energy efficiency programs provide the most consistent support for each rung on the "job-skill ladder" for the widest range of trades.

1.2 Many programs for many types of customers all over Los Angeles

The programs covered in this study serve residential customers as well as commercial, industrial and institutional customers. Numerous programs are simple in scope, like the Low Income Refrigerator Exchange Program (LIREP), which replaces older, inefficient refrigerators with new energy efficient ones, or the Home Energy Improvement Program (HEIP), which covers comprehensive weatherization, CFL light bulbs, window and room air conditioner replacement, and high efficiency toilets and faucet aerators among other items. Other programs, like the Custom Performance Program (CPP), may entail complex complete commercial building retrofits, requiring an energy audit, a work proposal and energy savings calculations prior to LADWP approval.

LADWP groups most of its programs into two broad categories. As shown in Table 1-1, the Mass Market Programs (MMP) support household and small business adoption of energy efficient technologies, ranging from lighting, refrigerators, heating and air conditioning, efficient windows, pool pumps, and weatherization, to tree planting for thermal shading. LADWP and its contractors deliver these programs to residential and small business customers through free, parts-and-labor-included direct installations or customer rebate programs.

Table 1-1: Mass Market Programs

Program	Targeted Market	Energy Efficiency Measures
Small Business Direct Install (SBDI)	Commercial	Lighting, Water Consumption, Gas Consumption
Home Energy Improvement Program (HEIP)	Residential	Lighting, Heating/Air Conditioning, Building Insulation, Water efficiency
Low Income Refrigerator Exchange Program (LIREP)	Residential	Refrigerator
Consumer Rebate Program (CRP)	Residential	Refrigerator, Windows, Roof, Pool Pump, Heating/Air Conditioning
City Plants	Residential	Shade homes from the sun

As shown in Table 1-2 on the following page, the Commercial, Industrial and Institutional (CII) Programs support the Los Angeles Unified School District (LAUSD), as well as commercial and industrial customers of various sizes. All are positioned to take advantage of LADWP's many and comprehensive energy efficiency retrofit programs. Many of these programs, such as the Commercial Lighting Efficiency Offer (CLEO) and the Custom Performance Program (CPP), provide incentives for more efficient lighting, heating and air conditioning as well as equipment controls which save energy and water. Also included in these programs are the Energy Efficiency Technical Assistance Program (EETAP), which incentivizes energy audits and the Codes, Standards and Ordinances Program, which supports building code updates to promote higher energy and water efficiency standards. This study takes an in-depth look at eleven of the Los Angeles Department of Water and Power's Energy Efficiency programs, outlined in Tables 1-1 and 1-2, which cover programs with an annual budget of $2 million or greater.

Table 1-2: Commercial, Industrial and Institutional (CII) Programs

Program	Targeted Market	Energy Efficiency Measures
LAUSD Direct Install	Institutional	Lighting, Heating/Air Conditioning, Equipment Controls
Commercial Lighting Efficiency Offer (CLEO)	Commercial	Lighting
Custom Performance Program (CPP)	Commercial	Lighting, Heating/Air Conditioning, Equipment Controls
LADWP Facilities Direct Install – (Lighting)	Institutional	Lighting, Heating/Air Conditioning, Equipment Controls
Energy Efficiency Technical Assistance Program (EETAP)	Commercial	Building Energy Audit (Feeder program for CPP)
Codes, Standards & Ordinances Programs	Residential/ Commercial/ Industrial/Institutional	Building Codes

LADWP also currently administers seven programs which have a budget of less than $2 million dollars annually (shown in Table 1-3 on the following page). Some of these programs support households who wish to recycle their refrigerators, retrofit their current home or build a new home with energy and water efficient technologies and recycling. Other programs provide a set of specialized services and rebates to commercial building owners. This study estimates the job impacts of these smaller programs by mapping their job-creation impact to similar larger programs described in Tables 1-1 and 1-2.

Table 1-3: Smaller Programs Under $2 Million Budget Annually

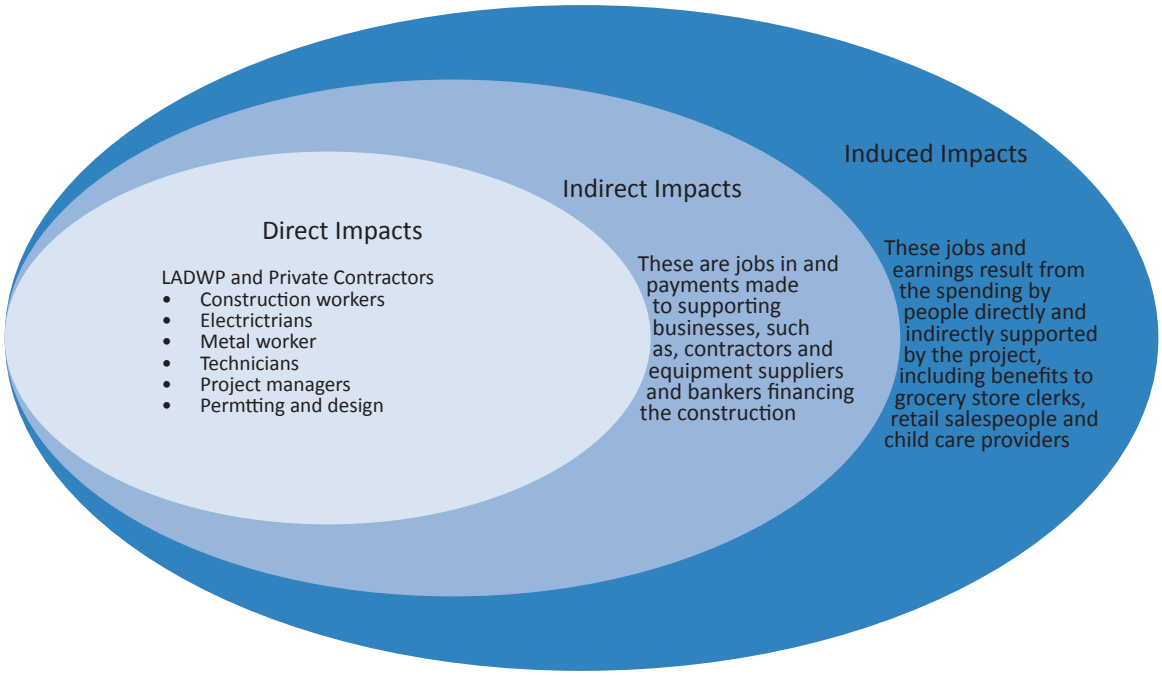
Program	Targeted Market	Energy Efficiency Measures
Refrigerator Turn-In & Recycle Program (RETIRE)	Residential	Refrigerator
California Advanced Home Program	Residential	New construction - all systems/whole house efficiency
Energy Upgrade California (EUCA)	Residential	Existing homes - All systems/ Whole house efficiency
Retrocommissioning Express (RCx)	Commercial	Optimization of Operation and Maintenance (O&M) of building subsystems
Chiller Efficiency Program (CEP)	Commercial	Air Conditioning
Refrigeration Program	Commercial	Commercial Refrigerators
Savings By Design (SBD)	Commercial	New construction - all systems/whole building efficiency

1.3 A primer on the job-creation impacts of energy efficiency

In this study we will estimate the creation of a "job-year" which simply means the equivalent of the employment of one person for one year. In practice, one job-year may take the form of two employees for six months each or three employees for four months each. The overall employment impact of each energy efficiency program includes direct, indirect and induced job-years created, as shown by Figure 1-1.

Direct jobs are the actual positions that are created by the energy efficiency projects. Indirect jobs are those jobs generated in the supply chain due to the indirect demand for inputs from the direct investment of the energy efficiency projects.

Figure 1-1: Energy Efficiency's Economic Ripple Effect



Source: Diagram adapted from U.S. Department of Energy study: 20% Wind Energy by 2030.

Induced jobs are those created from the demand for goods and services generated by increases in income to businesses, schools, homeowners and workers involved in these energy efficiency projects.[5] This increase in income is attributable to several possible sources when involving energy efficiency. First, the overall energy savings realized when an energy efficiency strategy is implemented generates immediate savings that can be reinvested into the local economy by the participant, which is why early adoption of energy efficiency is so important to ensure maximum cumulative energy savings over time. Second, for energy efficiency programs that offer rebates or other types of cash incentives to participants, these incentives again represent earnings that the participant can invest into the local economy. Finally, a share of the compensation earned by the employees carrying out the energy efficiency projects is expected to be reinvested into the local economy.

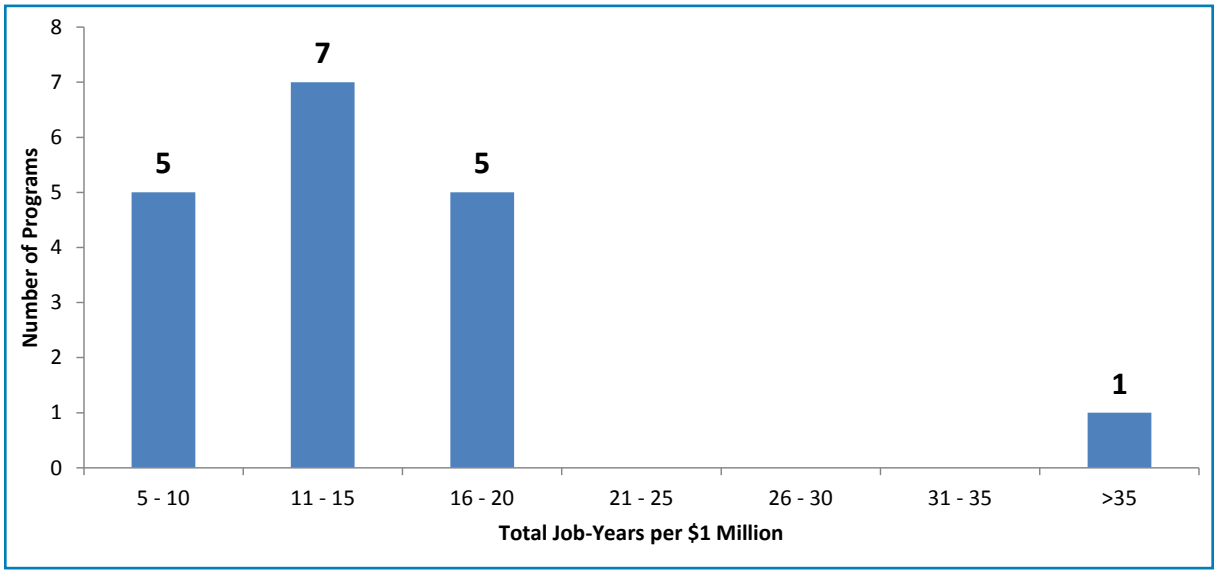
In this study we estimate the direct, indirect and induced job-years respectively in order to estimate the total number of job-years associated with investment in each energy efficiency program. A common way to measure the relative job-creation magnitude associated with each program is to describe how many total job-years are created when one million dollars are invested through each program.

5 Zabin and Scott, 2013.

1.4 Clean energy jobs for Los Angeles

Over 16 job-years per million dollars invested were found to be created on average across all of LADWP's energy efficiency programs (weighted by budget share). Figure 1-2 shows how the job-creation potential varies across all 18 assessed programs. On the low end, we see that five programs create between 5 and 10 job-years while seven programs create between 11 and 15 job-years. On the high end, five programs created between 16 and 20 job-years while one program creates over 35 job-years.

Figure 1-2: Number of Programs by Job-Creation Potential



Tables 1-4 and 1-5 on the following page describe the program specific job-creation potential for the 11 assessed programs with annual budgets over $2 million dollars. Table 1-4 describes the Mass Market Programs while Table 1-5 describes the Commercial, Industrial and Institutional Programs.

Table 1-4: Job-Years Created by Mass Market Programs

Program	Job-Years / $1 Million			
	Total	Direct	Indirect	Induced
Small Business Direct Install (SBDI) [a]	18 – 21.2	13 – 15.7	0.6	4.4 – 4.8
Home Energy Improvement Program (HEIP)	9.5	5.6	0.1	3.7
Low Income Refrigerator Exchange Program (LIREP)	5.7	3.7	0.2	1.8
Consumer Rebate Program (CRP) [b]	16.3 – 20.3	7.4 – 9.9	0.8 – 1.4	8.1 – 9.0
City Plants [c]	20.7 – 23.6	11.4 – 13	0.6	8.8 – 10

a Range based on 77% and 100% Local Purchasing Coefficient (LPC).
b Range based on 15% and 25% co-investment.
c Range based on 20% and 30% co-investment.

Table 1-5: Job-Years Created by Commercial, Industrial and Institutional (CII) Programs

Program	Job-Years / $1 Million			
	Total	Direct	Indirect	Induced
LAUSD Direct Install	20.9	16.3	0.4	4.2
Commercial Lighting Efficiency Offer (CLEO) [d]	19.1 – 22.4	7.4 – 9.4	0.9 – 1.5	10.8 – 11.5
Custom Performance Program (CPP) [e]	15.4 – 19	4.8 – 6.8	1.3 – 1.9	9.4 – 10.2
LADWP Facilities Direct Install – (Lighting)	10.8	6.7	0.1	4.1
Energy Efficiency Technical Assistance Program (EETAP) [f]	13 – 16.5	6.9 – 8.7	2.2 – 2.8	3.8 – 4.9
Codes, Standards & Ordinances Programs [g]	38.6 – 40.3	9.9	2.1	26.7 – 28.4

d Range based on 25%/75% and 55%/45% labor/materials ratio.
e Range based on 40% and 60% co-investment.
f Range based on 5% and 25% co-investment. Program launched in February 2014. Too soon to know what co-investment will look like, but early indications point to minimal amount of co-investment in addition to incentives.
g Range based on 33%/66% and 50%/50% residential/commercial energy savings.

As discussed in the previous section, LADWP also administers several smaller programs with budgets of less than $2 million per year. Table 1-6 presents the job-creation estimates for these programs. Unlike the larger programs for which job-creation potential was estimated from detailed project-specific data, we developed estimates for these smaller programs by mapping them to similar large programs.

Table 1-6: Job-Years Created by Smaller Programs Under $2 Million Budget Annually

Program	Job-Years / $1 Million			
	Total	Direct	Indirect	Induced
Refrigerator Turn-In & Recycle Program (RETIRE)	5.7	3.7	0.2	1.8
California Advanced Home Program	5.7	3.7	0.2	1.8
Energy Upgrade California (EUCA)	5.7	3.7	0.2	1.8
Retrocommissioning Express (RCx)	15.4 – 19	4.8 – 6.8	1.3 – 1.9	9.4 – 10.2
Chiller Efficiency Program (CEP)	15.4 – 19	4.8 – 6.8	1.3 – 1.9	9.4 – 10.2
Refrigeration Program	15.4 – 19	4.8 – 6.8	1.3 – 1.9	9.4 – 10.2
Savings By Design (SBD)	15.4 – 19	4.8 – 6.8	1.3 – 1.9	9.4 – 10.2

1.4.1 Comparing energy efficiency to other economic development investments

To assess the relative job-creation benefits of energy efficiency programs, it is instructive to compare them to other industries. For LADWP, comparing its energy efficiency programs with other energy investment opportunities is most appropriate. From Table 1-7, we see that energy efficiency programs compare favorably to other LADWP-funded energy investments such as natural gas development and smart grid and solar generation deployment, which generate 5.2, 12.5 and 13.7 job-years per million dollars invested respectively.[6] The residential construction industry, often focused upon as an engine of job growth in Los Angeles, is another useful benchmark. As shown in Table 1-7, we see the residential construction industry is estimated to generate 10.7 job-years per $1 million invested. Investment in both the energy sector and the residential construction sector are expected to produce appreciable but fewer jobs than the 16 job-years per $1 million invested in energy efficiency.

Table 1-7: Job-Years Created by Comparison Industries

Industry	Job-Years / $1 Million		
	Total [h]	Direct	Indirect
Natural Gas [i]	5.2	0.8	2.9
Construction [j]	10.7	6.0	2.2
Smart Grid [i]	12.5	4.3	4.6
Solar [i]	13.7	5.4	4.4
LADWP Energy Efficiency Programs	**16.0**		

h Total includes induced labor, not separately shown in this table.

i Source: Pollin, Heintz, & Garrett-Peltier, "The Economic Benefits of Investing in Clean Energy", 2009, University of Massachusetts, Amherst, Political Economy Research Institute.

j Source: IMPLAN, 2012 Los Angeles County dataset.,

1.4.2 Calculating a weighted-average estimate across all programs

The average estimate of 16 job-years per $1 million invested is a budget-weighted average across all energy efficiency programs at LADWP. In Table 1-8, we present the budget shares for each of the 11 largest programs and the aggregate budget share for the 7 smaller programs assessed. The largest program by budget share is the Small Business Direct Install with a budget of almost $37 million per year. This is followed in size by 4 programs with budget shares in the $8-12 million range: Home Energy Improvement program, LAUSD Direct Install, Commercial

6 Pollin, Heintz, & Garrett-Peltier. (2009). The Economic Benefits of Investing in Clean Energy, University of Massachusetts, Amherst, Political Economy Research Institute.

Lighting Efficiency Offer and the Custom Performance Program. Together these five programs represent almost 70% of the LADWP energy efficiency budget, and correspondingly, their job-creation potential has a substantial impact on the estimate of 16 job-years per $1 million invested.

Table 1-8: Aggregate Job-Years Created for 2013-2014 Budget

	Program	13-14 Budget	Job-Years / $1M [k]	Job-Years at Full Budget
MASS MARKET	Small Business Direct Install (SBDI)	$36,987,000	18	665.8
	Home Energy Improvement Program (HEIP)	$12,678,000	9.5	120.4
	Low Income Refrigerator Exchange Program (LIREP)	$6,940,000	5.7	39.6
	Consumer Rebate Program (CRP)	$2,394,000	16.3	39
	City Plants	$2,250,000	20.7	46.6
CII	LAUSD Direct Install	$11,569,000	20.9	241.8
	Commercial Lighting Efficiency Offer (CLEO)	$9,000,000	19.1	171.9
	Custom Performance Program (CPP)	$8,100,000	15.4	124.7
	LADWP Facilities Direct Install – (Lighting)	$2,865,000	10.8	30.9
	Energy Efficiency Technical Assistance Program (EETAP)	$5,179,000	13	67.3
	Codes, Standards & Ordinances Programs	$2,000,000	38.6	77.2
	Smaller Programs (< $2 million each)	$8,925,000	13.5	120.5
	Average Job-Years for LADWP EE Program Portfolio	-	**16.0**	-
	Total Jobs Created at Full Budget	**$108,887,000**	-	**1,746**

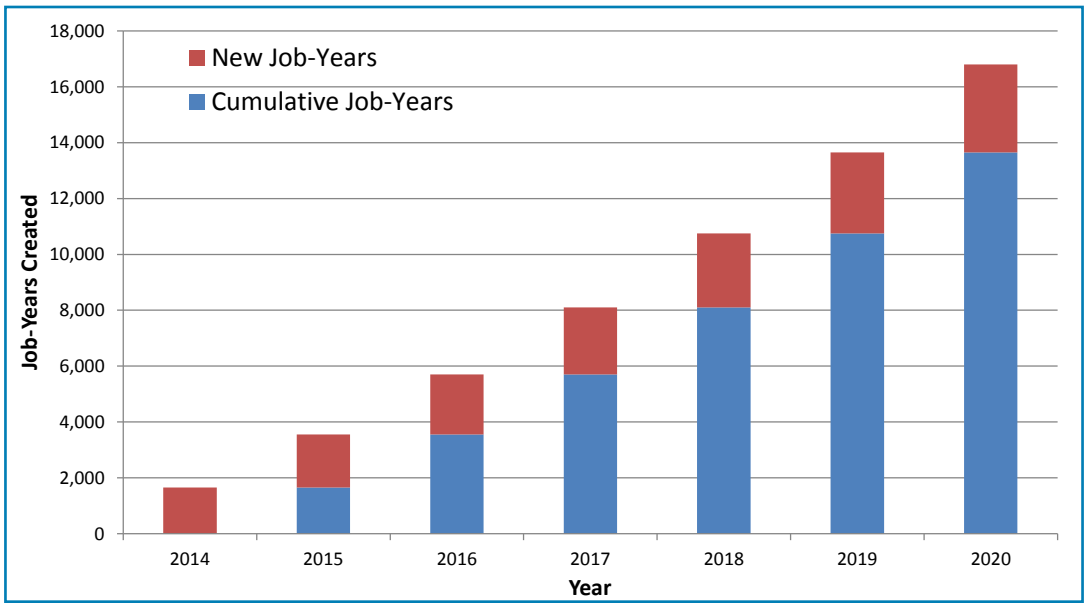
k Where there is a range on the job-year/$1M multiplier, lower bound is used.

1.4.3 Job creation through 2020

Forecasting job-creation potential through 2020 requires grappling with several sources of uncertainty. First, we know from other studies about job creation that energy efficiency installers learn how to use labor more efficiently over time. This means that we expect labor productivity (how much output each job-year produces) to increase over time. Because fewer workers will be needed to do the same job, we anticipate a decrease in the magnitude of our estimated direct job-creation multipliers over time. Second, we expect the energy savings associated with energy efficiency projects to follow a certain time pattern over the course of a program. Specifically, we expect projects in the early years to be associated with greater energy savings than projects in the later years. This "selection effect" is due to the fact that businesses and households with the most to gain from these programs are likely to participate earlier than those with relatively less to gain who may participate later on. The effect of reducing the per-project energy savings over time will reduce the magnitude of the induced job creation. Third, we also expect the real price of energy to increase over time at a rate of about 4% per annum. All else equal, this increase in energy costs should increase the magnitude of the costs savings associated with energy efficiency projects for businesses and households in future time periods, leading to increased induced job-creation effects.

Taken together, two factors cause decreases in our future job-creation estimates (increased labor productivity and project selection effects for energy savings), while one factor (cost savings) will increase future job-creation effects. On net, we assume that these factors will lead to a 3% per annum decrease in the total job creation. In Figure 1-3, areas shaded in red show each year's incremental job-creation growth, which starts in the year 2014 with 1,654 job-years created. This number includes LADWP job-years for direct install programs, but does not include LADWP administrative jobs, which are not linearly scalable with investment. The blue shading, starting in 2015, shows the cumulative job-years created up to every given year of total past job creation. We see that by the end of 2020, energy efficiency programs have the potential to create nearly 17,000 job-years in Los Angeles.

Figure 1-3: Total Job Creation Through 2020



Note: Does not include LADWP jobs except for those associated with direct install programs.

1.5 Value of total economic activity

To calculate the total economic activity generated regionally each year from LADWP's energy efficiency programs, we must add up three types of expenditures as shown in Table 1-9. The first is LADWP's annual spending on each program as shown in the second column of Table 1-9, amounting to over $108 million in 2013-14. The second is the co-investment spending that is required by participating customers which amounts to an estimated total of nearly $8 million in 2013-14. Finally, customer energy cost-savings will augment spending associated with the direct and indirect job creation, leading to additional expenditure which we estimate to be over $143 million in 2013-14. When these three components are added together, LADWP spending on energy efficiency programs would generate over $260 million in regional economic activity in 2013-14 once the budget is fully invested.

To better understand what factors influence the size of the value of indirect and induced output (the fourth column in Table 1-9), we focus on customer cost-savings and co-investment. Each program differs significantly in the amount of energy saved for customers. The greater the amount of energy saved, the greater the amount of money that will be freed up for reinvestment into the larger regional economy. An example of this is seen with the Codes, Standards and Ordinances Program, the largest energy saver across the entire LADWP energy efficiency portfolio. A second, less important factor is the co-invested amount required of customers in each program. These are programs that offer incentives such as rebates that ultimately split the cost of the customer's energy efficiency project between LADWP and the customer. Hence, the customer contributes their own money into the regional economy in tandem with LADWP investment. From Table 1-9, we see that only five of LADWP's major programs require co-

investment from the customer.

Table 1-9: Value of Total Economic Activity

	Program	LADWP 13-14 Budget	Customer Assumed Co-investment[1]	Value of Indirect and Induced Output
MASS MARKET	Small Business Direct Install (SBDI)	$36,987,000	-	$38,722,648.87
	Home Energy Improvement Program (HEIP)	$12,678,000	-	$7,597,701.49
	Low Income Refrigerator Exchange Program (LIREP)	$6,940,000	-	$2,789,573.93
	Consumer Rebate Program (CRP)	$2,394,000	$359,100	$4,370,061.49
	City Plants	$2,250,000	$450,000	$4,057,195.14
CII	LAUSD Direct Install	$11,569,000	-	$11,547,624.00
	Commercial Lighting Efficiency Offer (CLEO)	$9,000,000	$3,600,000	$19,323,841.87
	Custom Performance Program (CPP)	$8,100,000	$3,240,000	$17,789,054.42
	LADWP Facilities Direct Install – (Lighting)	$2,865,000	-	$1,958,705.34
	Energy Efficiency Technical Assistance Program (EETAP)	$5,179,000	$258,950	$9,826,376.00
	Codes, Standards & Ordinances Programs	$2,000,000	-	$10,066,784.00
	Smaller Programs (< $2 million)	$8,925,000	-	$15,579,262.47
	Subtotal	**$108,887,000**	**$7,908,050**	**$143,628,829**
	Grand Total	**$260,423,879**		

1 Where there is a range in "Customer Assumed Co-investment," lower bound is used.

1.6 Understanding differences in job creation across LADWP's energy efficiency programs

Three primary factors may explain much of the variation in the magnitude of job-years created across energy efficiency programs. First, those programs that require co-investment by the customer tend to see an increase in the job-years created. The co-investment required by the participant increases the amount of total investment and ultimately the amount of money captured in the economic model. Leveraging LADWP's initial investment in this way creates an increased return on investment, measured in higher job-years, at no extra cost to LADWP. The Custom Performance Program (CPP) and Consumer Rebate Program (CRP) are good examples of the impact co-investment can have on the number of job-years created.

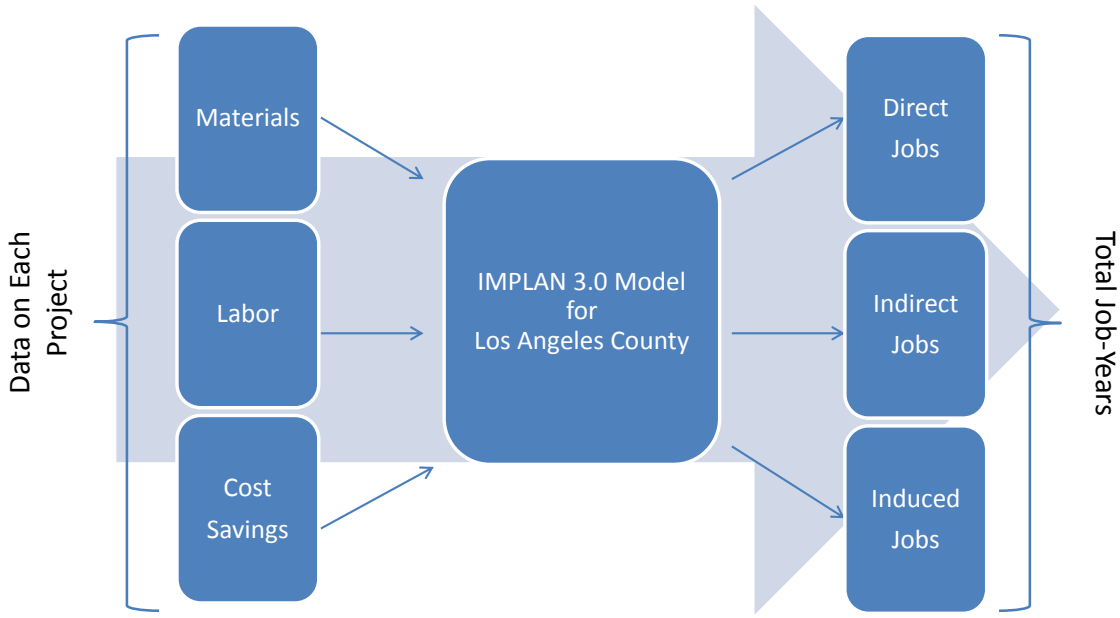
Second, a large contributor to the creation of job-years for many of the programs came from induced jobs. Three main categories influenced the number of induced job-years created: incentives or rebates received by the customer, economic reinvestment due to customer energy savings, and LADWP employee compensation. The strongest economic impact of these was felt from the energy savings; with customers putting newly freed money back in to the local economy. The Commercial Lighting Efficiency Offer (CLEO) and Small Business Direct Install (SBDI) programs are good examples of this effect. Both create large energy savings and have the expected high induced labor output (see Tables 1-4 and 1-5). LADWP employee positions, by comparison, comprise only about 5% of the total job-years estimated to be created by LADWP's energy efficiency investment.

A final factor, which only impacts direct job-years created, is how staff-intensive a particular program is to administer. These jobs are those within LADWP or with outside (third-party) contractors who dedicate a portion or all of their time to a specific program. These jobs range from administrative to engineering and construction for LADWP as well as third-party contractors. Ultimately, these positions contribute to direct job-years. Some programs, such as City Plants and Small Business Direct Install (SBDI), fielded a notably greater number of direct positions for a given amount of savings than others, such as the Custom Performance Program (CPP).

1.7 Methods: How our job-creation model works

For each of the 11 major energy efficiency programs, we collected detailed project-level information which we put into an input-output model for Los Angeles County. Specifically, we used Version 3 of IMPLAN, an input-output model commonly used for predicting the economic impacts of an arriving or departing industry on a specific geographic location. IMPLAN estimates annual changes in jobs within a defined region based on annual changes in economic activity as measured by the direct, indirect and induced employment multipliers.

Figure 1-4: Our Research Process



The bulk of the research for this study involved collecting real-world data for each of the assessed energy efficiency programs. Expressed in its most basic form, this model requires three data inputs for each program: materials, labor and economic savings. A challenge for this study was to comprehensively account for these inputs, making sure that all associated costs and programmatic elements were included and correctly categorized. Inputs go in as dollar values, so while we may know that 2,000 efficient fluorescent light bulbs were installed for a job, it is the cost of these bulbs and energy savings they produce that ultimately matters.

The materials input covered a variety of physical goods, most frequently light bulbs, fixtures and sensors, but also trees, roofing materials, refrigerators, pool pumps, HVAC systems, windows, home insulation materials, etc. Every program has its own focus which dictated what materials went into the model. For example, the Commercial Lighting Efficiency Offering Program (CLEO) only covers lighting upgrades. In the model, "lighting" is input as dollar values assigned to the three relevant industries: bulb manufacturers, fixture manufacturers and sensor manufacturers.

Labor for this model is accounted for in two general categories. The primary category of labor input is for labor that went into performing upgrades or for related technical services. These most typically included construction or electrical work, as well as roofing, plumbing and architectural and engineering services. The second category includes LADWP employees and subcontractors. This secondary input, to draw an analogy, can be thought of as overhead. Its effects are mostly felt on the induced labor output.

Economic savings is the final input for the model, and should be understood as economic savings derived from energy savings. LADWP associates a level of energy savings with every energy efficiency intervention for which they offer an incentive. For example, swapping in a

high efficiency T8 fluorescent tube and fixture in place of a low efficiency T12 tube and fixture equates to a certain set amount of kilowatt hours saved per year. The same is true with energy efficient windows, cool roofs, energy star refrigerators, etc. Energy savings for all the programs is determined using the savings for each intervention along with the number of those interventions installed for a given program.

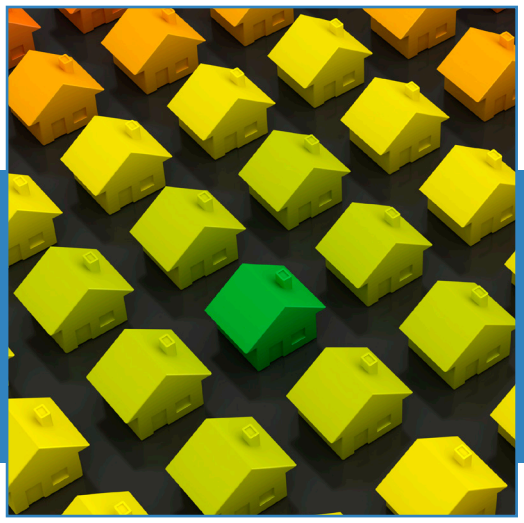
The energy savings (in kilowatt hours) was multiplied by the corresponding cost per kilowatt hour to turn the energy savings into economic savings. The cost per kilowatt hour used in this study is all-inclusive, rolling all the non-electricity costs that customers pay, such as taxes and fees, into one composite number. The appropriate per kilowatt hour cost for each program was used according to who the affected customers were. In the case of a residential program, the cost for residential customers was used. For the low income/Life Line programs, that corresponding rate was used, while commercial and industrial programs had a different rate.

1.8 Opportunities for future research

This study provides an overview of the number of jobs created for LADWP's energy efficiency programs based on a weighted-average program investment model. This approach suggests several avenues of further investigation into the topic. First, as stated above, energy efficiency jobs offer a wide spectrum of opportunity for a wide pool of potential applicants. An opportunity exists to delve deeper into this spectrum of opportunity and comprehensively evaluate the quality of jobs created. Second, the relative levels of geographic and socioeconomic access to these broad-spectrum job opportunities in a particular region such as greater Los Angeles are areas ripe for exploration. Finally, LADWP's own portfolio of energy efficiency investments will necessarily evolve over time, affording many opportunities for the longitudinal analysis of job creation and economic development impacts resulting from a sustained investment in promoting customer energy efficiency.

Finally, continued data collection and research will help support policy efforts and commitment of resources for meeting energy efficiency goals as well as concomitant economic benefits, including job creation and related multiplier effects.

2. Introduction to Energy Efficiency Programs and Methodology



This report estimates the magnitude of job-creation benefits for the largest 18 energy efficiency programs administered by the Los Angeles Department of Water and Power (LADWP) in 2014. To determine the job creation benefits for each of the assessed18 energy efficiency programs, we collected detailed project level information which we insert into an input-output model for Los Angeles County. Specifically, we used Version 3 of IMPLAN, an input-output model commonly used for predicting the economic impacts of an arriving or departing industry on a specific geographic location. IMPLAN estimates annual changes in jobs within a defined region based on annual changes in economic activity as measured by the direct, indirect and induced employment multipliers.

The remainder of the report provides background information about each of the studied programs as well as an in-depth description to the approach taken to achieve the final job impact numbers. The methodology is broken down into the three input categories for the IMPLAN model: Labor and goods, LADWP and contractor FTEs and the amount of energy saved.

Labor and Goods

The goods input covered a variety of physical materials, most frequently light bulbs, fixtures and sensors, but also trees, roofing materials, refrigerators, pool pumps, air conditioners, windows, home insulation materials, etc. The labor input, meanwhile, is for labor that went into performing these upgrades or for related technical services. These most typically included construction or electrician work, as well as roofing, plumbing and architectural and engineering services. Specific goods purchases and labor payments were based off of budget materials such as customer invoices. If a program, such as SBDI, swapped out T12 fluorescent bulbs and ballasts for high efficiency T8 bulbs and ballasts, the IMPLAN input would include the total dollar amount spent on T8 bulbs, the total dollar amount spent on T8 ballasts, and the total labor costs for installation. Inputs go in as dollar values, so while we may know that 2,000 efficient fluorescent light bulbs were installed for a job, it is the cost of these bulbs and energy savings they produce that ultimately matters.

Some programs, such as CLEO, required a calculation for coinvestment. Through incentives, these programs prompt the customer to invest some amount of their own money to complete the energy efficiency project. In some cases, the coinvestment percentage was based off of LADWP and contractor interviews; in others, coinvestment was tracked through LADWP budget materials. When assumptions had to be made, a low end and high end bound were calculated.

LADWP and Contractor FTEs

For each program, LADWP and the corresponding third party contractor reserve a specific number of employees to administer the program. These are referred to as FTEs, or full-time equivalents. For IMPLAN, these numbers are plugged back into the direct jobs category once the model is complete. FTE counts for both LADWP and the third party contractor were gathered during interviews with each program's respective employee contact.

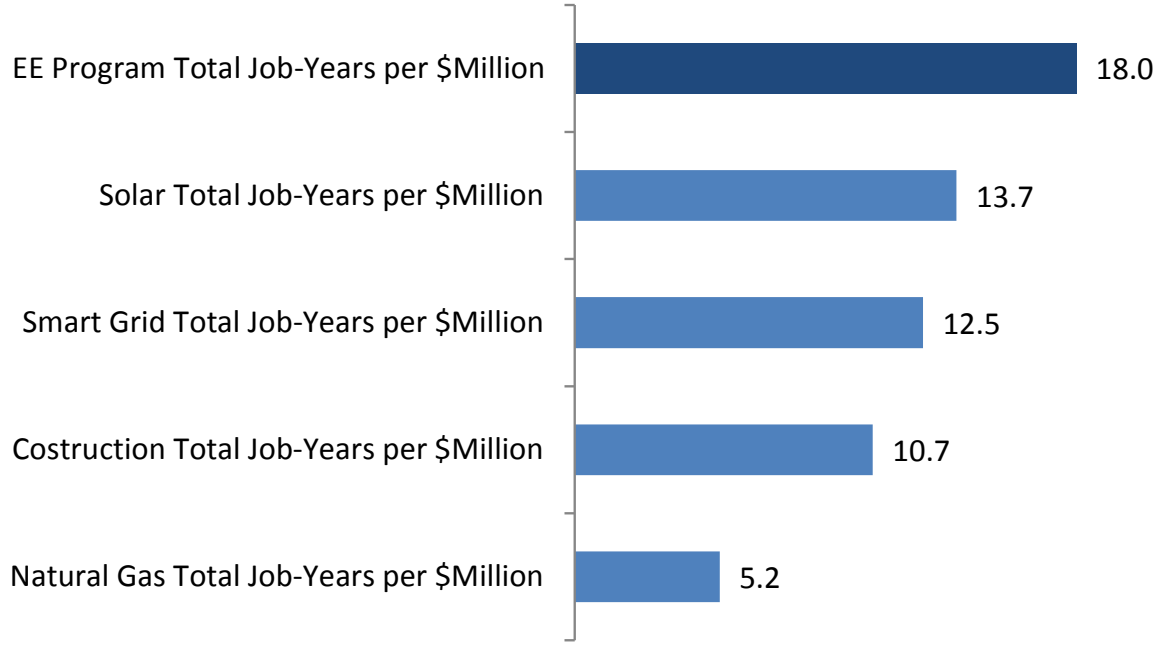
Energy Saved

The customers realizing the energy savings for the studied programs can be LADWP residential, commercial, and institutional customers. In IMPLAN, the saved money becomes another input, categorized as either household income change for residential customers, proprietor income for commercial customers, elementary and secondary schools industry change for schools participating in the LAUSD Direct Install program, or electric power generation, transmission and distribution industry change for the LADWP Facilities Upgrade program. To determine these model inputs, the savings of all the measures accounted for were added up and forecast to one year and then multiplied by the average cost of electricity to the customers. This cost per kilowatt hour came from a LADWP energy sales report that took a moving average of total kilowatt hours consumed divided by total revenue. It is an all-inclusive rate, accounting for taxes, fees and all other non-electricity costs that consumers are billed.

3. Small Business Direct Install Program

Customer Type: Commercial
Intervention Type: Lighting
Annual Budget: $36,987,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

3.1 Introduction

The Small Business Direct Install Program (SBDI) is a free direct install program in which the LADWP targets small and medium businesses, offering upgrades to targeted systems, including lights, water and natural gas. The electricity side of the program, which deals with the lighting measures, has been up and running since the first half of 2013 and is currently fully ramped-up. The water and natural gas side of the program is just starting as of the writing of this study (Q2 2014).

This analysis focuses on the lighting side of the program, which is run through a LADWP contractor, Enerpath. Enerpath is in charge of initial building assessments, enrollments and installations — some of which they do, and much of which is completed by subcontractors.[7] Weekly reports on assessments, enrollments and installations are sent to LADWP.

SBDI is an important program in LADWP's energy efficiency program portfolio, currently budgeted for nearly one third of the total energy efficiency program budget. It creates a large amount of energy savings, and is also a strong job creator, both directly and induced.

3.2 Methodology

The data used to analyze SBDI came from both LADWP and Enerpath and consisted of budget reports, invoices, weekly updates and assessments, install and enrollment data. An in-person interview was conducted with one of the lead LADWP program managers and several phone interviews were conducted with a LADWP management analyst for the program. A phone interview was also conducted with one of the Enerpath program managers.

With lighting installations through SBDI starting in April of 2013, there was close to one complete year of data for the program, although some projections were necessary to get a one-year data input. The program took some months to ramp-up, which is evidenced in the data, as monthly assessments, enrollments and installations all grew over the course of the year. By the end of 2013, the program appeared to have fully ramped-up and reached its monthly potential. Where necessary, adjustments were made to account for the initial lower numbers.

Given the initial ramp-up period, it is possible that the job numbers for this program are low compared to what they would be if the program continues at full clip. However, considering that it is a new program, and it remains to be seen how it will look in future years, using this initial one-year sample offers a good minimum baseline for what the program can produce.

3.2.1 Labor and goods

As a direct install program, accounting for the different labor and material inputs with SBDI is relatively simple compared to the incentive based programs that have co-investment. There was a fixed amount of money spent on the program, and LADWP budget reports show that the majority of spending went to Enerpath, while the small portion spent within LADWP was

7 List of other subcontractors – Herzog, On Target, Marin Bravo, New Wave, Jovi Electric, Rosedin.

employee compensation and benefits.

Enerpath provided reports for the work done to date, which included the number of customers that had assessments, were enrolled and actually had retrofits done. The reports also included energy savings, cost per kilowatt hour saved and average cost per customer.

The principle complication in determining the inputs for IMPLAN was that Enerpath does not differentiate labor and material costs when billing LADWP. Labor, material and overhead are embedded into one charge. For example, the amount charged to retrofit a lamp with one 51-watt 8-foot T8 fluorescent lamp is $78.11. The cost for a two lamp version is $90.94. These charges include the materials, the time for the installer to do the work, and overhead. To disaggregate these components, Enerpath provided a percentage attributable to labor and material, with overhead — primarily consisting of office employees — included in the labor portion for this study. This ratio is ultimately an estimate on Enerpath's part, taking into consideration the subcontractors they are dealing with and the variable amount of time to perform jobs. It should nevertheless accurately depict the program.

SBDI covers a wide variety of lighting measures, although as with most of the energy efficiency programs in LADWP's portfolio, swapping out T12 fluorescent bulbs and ballasts for high efficiency T8 bulbs and ballasts accounts for a large portion of the retrofits. Other measures include installing CFL bulbs, LED bulbs, low wattage LED exit signs, HID lamps and various sensors.

Data from LADWP detailing the measures that were installed provided the basis for the mix of measures that went in to IMPLAN as the material inputs. The four industries included were lamp manufacturing, ballast manufacturing, sensor manufacturing, and fixture manufacturing. Typical fluorescent retrofits did not include the fixture, just ballasts and lamps, usually with a single aggregated cost. As with the other programs analyzed in this study, an 80/20 cost split was used for these measures. The following table shows the individual share of material costs for material inputs associated with the SBDI model.

Table 3-2: SBDI Share of Material Costs

Category	Share of Material Costs
Lamps	38%
Ballasts	53%
Sensors	1%
Fixtures	8%

3.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to

customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

For SBDI, items were purchased within Los Angeles County and at wholesale prices. This follows LADWP procurement rules, which were applied to Enerpath as the principle contractor.

3.2.3 LADWP and contractor FTEs

The LADWP program contact provided an FTE count for SBDI, which was used along with the LADWP salary database to establish an overhead cost for the program.[8] The Enerpath contact provided an FTE count for all of its employees and it subcontractors. In total, LADWP counts 5.5 fixed FTEs for the program, and Enerpath counts 120 FTEs.

The large number of direct FTEs to add back in to the IMPLAN results is consistent with this being a labor intensive direct installation program. A question regarding where the Enerpath and subcontractor employees live arose when deciding how to count the FTEs and their income.

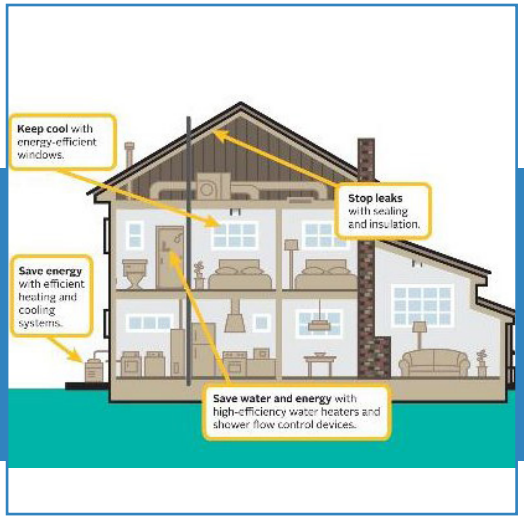
Most of the subcontractors are located in or just outside Los Angeles County, however Enerpath Headquarters is located in Redlands, San Bernardino County, about 30 miles from Los Angeles County. The Enerpath contact provided a conservative estimate for the number of people who work in this program and live in Los Angeles, noting that most of the companies draw their installation employees from the International Brotherhood of Electrical Workers (IBEW) union. To adjust for the unknown number of Los Angeles County residents among the FTEs, a 78% local purchasing coefficient was used for the employee compensation, and no Enerpath employees were counted for the low-bound estimate. This percentage represents all FTEs except for Enerpath employees. For the high-bound, it was assumed that all money stays in Los Angeles County and all employees live in the county.

3.2.4 Energy saved

Every measure that Enerpath installs has an associated level of "energy savings." The annual savings for the one-year period in this study was 29 million saved kilowatt hours. Using a per kilowatt hour cost for commercial customers of $0.133, the value of the energy savings came out to $3,851,397. The $0.133 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees and all other non-electricity costs that consumers are billed. In IMPLAN, the saved money becomes an input categorized as proprietor income change.

8 LADWP job classes generally have five steps within a class, which progress from the lowest salary (Step 1) to the highest salary (Step 5). For the purposes of this study, step three, which is the median salary, was used as the representative salary when an FTE count did not specify the step within a job class. The salaries found on the website when this study was authored (Spring 2014) were from October 2012.

4. Home Energy Improvement Program

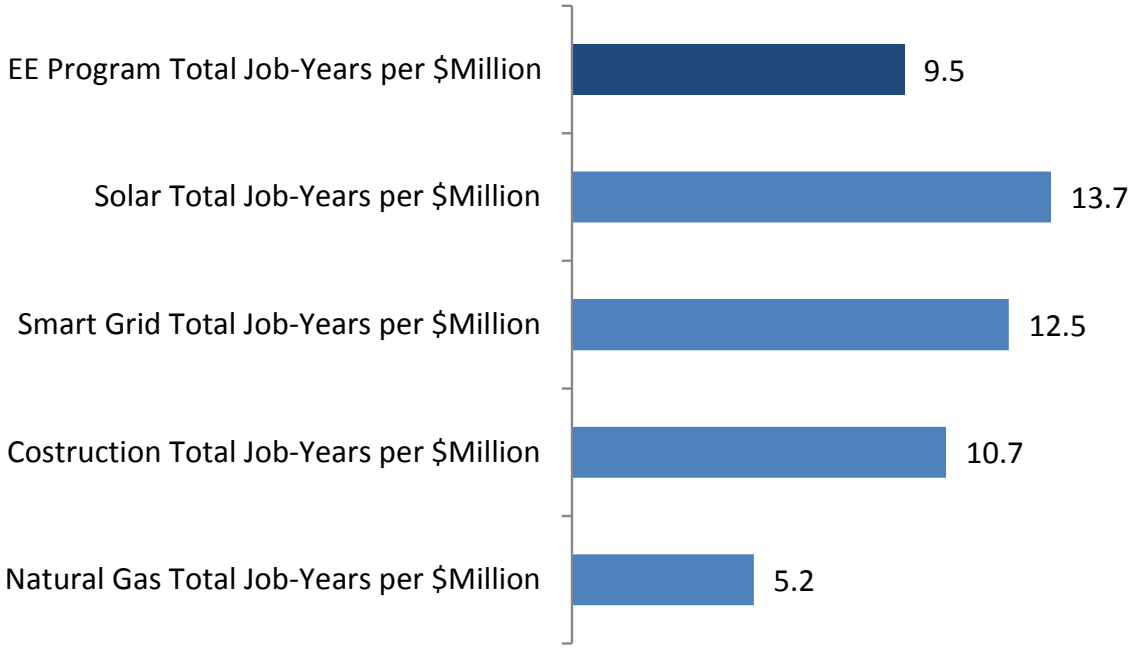


Customer Type: Residential

Intervention Type: Building Envelope, HVAC, Plumbing, Lighting and Equipment Controls

Annual Budget: $12,678,000

Program Jobs vs. Comparable Industries



4.1 Introduction

The Home Energy Improvement Program (HEIP) is a free direct install program which targets residential customers. It offers a full suite of free products and services to improve energy and water efficiency in the home by upgrading or retrofitting a home's envelope and core systems. Targeted systems include lights, water and natural gas. This program is not specifically limited to low income customers, however its priority is to serve low, moderate and fixed income customers most in need first.[9]

This program is run directly by LADWP, with the Integrated Support Services (ISS) department handling the assessments and installations, and the energy efficiency team responsible for program design, management and billing. HEIP is an important program in LADWP's energy efficiency portfolio, currently budgeted for just over ten percent of the total energy efficency program budget.[10]

4.2 Methodology

The data used to analyze HEIP came from LADWP, and consisted of budget reports, weekly updates, assessments, install and enrollment data and individual project files. An in-person interview was conducted with one of the lead LADWP program managers, and several phone interviews were conducted with a LADWP management analyst for the program. This program started in the 2012-2013 fiscal year and was fully ramped-up for the 2013-2014 period used for this study.

4.2.1 Labor and goods

As a direct install program run by LADWP, accounting for the labor and overall materials inputs with HEIP is relatively simple compared to the incentive based programs that have co-investment. There was a fixed amount of money spent on the program over the one-year period, and LADWP budget reports show where the money goes. Parsing out the specific expenditures on materials was the principle challenge with this program.

LADWP does not keep a database of the individual measures that have been installed or retrofitted. Each house is a unique case, and ISS electricians and plumbers keep paper records of the specific work done at each home. Work is typically done over a period of months, and will include separate visits for an initial assessment, plumbing and electrical work, and pulling permits. Permits are required for certain services such as attic insulation.

To dissect the material expenditures as accurately as possible, a sampling of cases was looked at and used to average out the percentage of project spending going to the individual measures installed in each home. The general categories used to sort the individual measures are shown in the following table.

9 Los Angeles Department of Water and Power. *Energy Efficiency Portfolio Business Plan FYs 2013/2014 - 2019/2020. Business Plan*, Los Angeles: LADWP, 2014.

10 Ibid.

Table 4-1: HEIP Sample Measures

Category	Example of measures
Construction Materials	Caulk, screws, dusk mask, coverall, plywood
HVAC	5,000 up to 12,000 BTU window mounted air conditioner
Insulation	Fiberglass insulation, Whirly Birds, door weatherstripping, ventcap, Lexan polycarbonate sheeting
Plumbing	Toilet, toilet seat, toilet wax ring, flex water valve, low flow faucet, low flow shower head
Sensors	Smoke alarm, carbon monoxide alarm, ionization smoke alarm
Light Bulbs	CFL light bulbs

LADWP shared detailed case information for nine homes, and while this is a relatively small sample size, trends were apparent. In each category, the highest and lowest percentage shares from the nine homes were removed to manage outliers. The insulation and building envelope materials on average accounted for nearly half the material costs, while plumbing and HVAC each accounted for around 15% of project spending. Light bulbs, alarms, and general construction materials made up 10%, 6% and 5% respectively (Table 4-2). These percentage shares were mapped to the overall amount spent on materials, a number taken from the HEIP budget report, and accounted for all the materials inputs used in IMPLAN.

Table 4-2: HEIP Share of Material Costs

Category	Share of Material Costs
Construction Materials	5.8%
HVAC	14%
Insulation	47%
Plumbing	17.2%
Sensors	6%
Light Bulbs	10%

The industries included in the IMPLAN model were mineral wool manufacturing, which covered the insulation materials, plumbing fixture fitting and trim manufacturing, ceramics and plumbing fixture manufacturing, air conditioning manufacturing, sensor manufacturing, bulb manufacturing, adhesives manufacturing and surgical appliance and supplies manufacturing, which covered protective masks and clothing used on job sites.

4.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

Items were purchased for HEIP within Los Angeles County and at wholesale prices following LADWP procurement rules.

4.2.3 LADWP FTEs

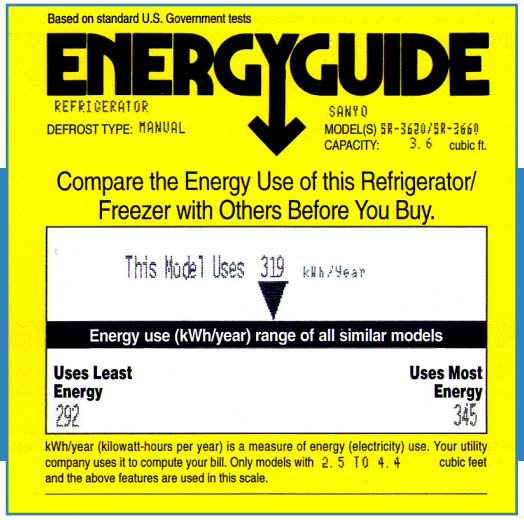
The LADWP program contact provided an FTE count for HEIP, which was used along with the LADWP salary database to establish an overhead cost for the program.[11] LADWP counts 3.15 FTEs for the program in the energy efficiency department. This includes the part time work of several utility service specialists, one senior utility service specialist, and one utility services manager. The bulk of the FTEs attributed to this program, 41, come from the ISS department. These FTEs include a manager, clerk, various engineers, and chiefly carpenters, plumbers, roofers, and apprentices. This large number of direct FTEs going back in to the IMPLAN results is consistent with the program type, given that the retrofitting work is labor intensive and the model is direct install.

4.2.4 Energy saved

Every measure that LADWP installs has an associated level of "energy savings." The annual savings for the one-year period in this study was 766,670 saved kilowatt hours. Using a per kilowatt cost for residential customers of $0.135, the value of the energy savings came out to $103,500. The $0.135 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed. In IMPLAN, the saved money becomes an input categorized as household income change.

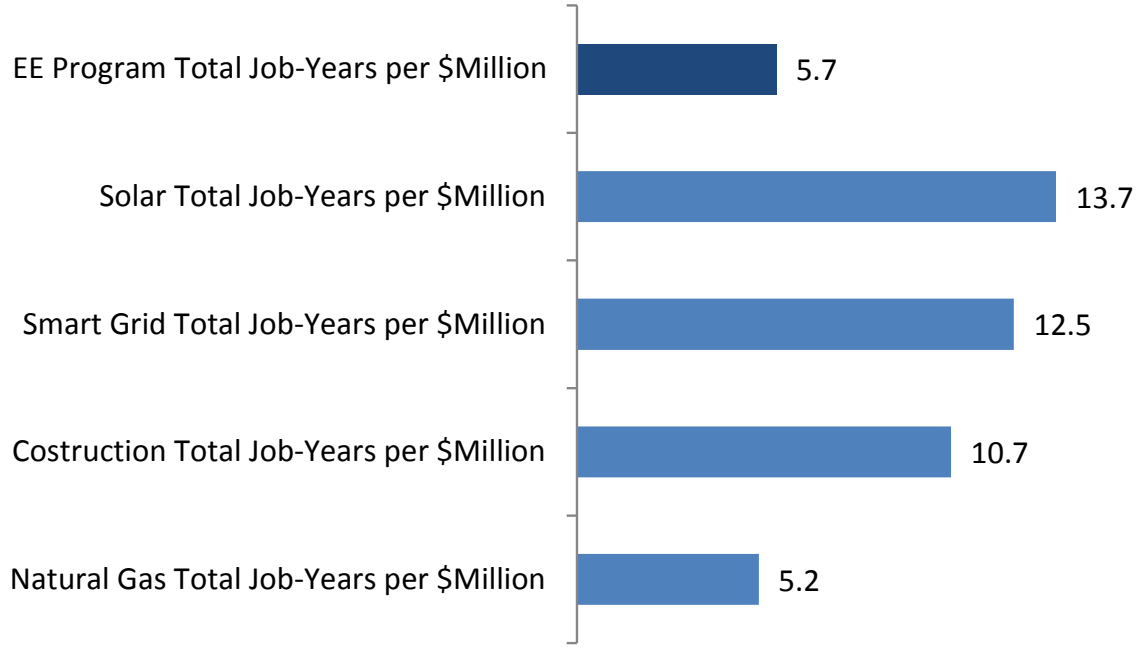
11 LADWP job classes generally have five steps within a class, which progress from the lowest salary (Step 1) to the highest salary (Step 5). For the purposes of this study, step three, which is the median salary, was used as the representative salary when an FTE count did not specify the step within a job class. The salaries found on the website when this study was authored (Spring 2014) were from October 2012.

5. Low Income Refrigerator Exchange Program



Customer Type: Low-Income and Senior/Lifeline Residential
Intervention Type: Refrigeration
Annual Budget: $6,940,000

Program Jobs vs. Comparable Industries



5.1 Introduction

The Low Income Refrigerator Exchange Program (LIREP) is a program that delivers free new energy efficient refrigerators to low-income and senior/lifeline LADWP customers who have refrigerators meeting a certain criteria, including being at least 10 years old, 14 cubic feet or greater and in working condition. These older, inefficient refrigerators are a major source of electricity consumption as they run all day, every day and are not built to current Energy Star standards. The program ensures that the old refrigerators stay offline and cannot burden the grid by picking them up and recycling them when a new one is delivered.

As part of the effort to promote energy efficiency, customers receive four free CFL light bulbs as well when they receive their new refrigerator. This is not considered an added cost to the program because LADWP purchased these lamps several years ago through another program and stocks them in a warehouse. As with all of the programs in LADWP's energy efficiency portfolio, this program has the dual benefit of lowering demand on the grid while also lowering the customers' bills.

LIREP is run through a third party contractor, Appliance Recycling Centers of America (ARCA) with just a couple of LADWP employees needed to administer the program for LADWP. ARCA handles the pickup and delivery of the refrigerators, the recycling of the old refrigerators, the program intake and call center, marketing and customer service. This is a mature program that has been around since 2007, but has seen notable variations in the number of annual refrigerator deliveries over the years.

Despite the eponymous implications of its name, the program will start expanding beyond low-income and lifeline customers into other customer segments, including multi-family buildings, schools, congregational institutes, civic and community buildings. While it is a capital-intensive program, with the cost of the refrigerators making up the majority of program costs, the reduction to grid demand is very high and of significant benefit to LADWP.

5.2 Methodology

The data for LIREP expenditures was provided by LADWP, and originated with ARCA, who maintains running monthly totals of their work in order to bill LADWP. Unlike the other LADWP programs researched in this study, LIREP data was for the calendar year of 2013 instead of the fiscal year. The data consisted of the number of refrigerators delivered, sorted as 15 cubic feet or 18 cubic feet, the number and cost of site inspections, the delivery and recycling costs, the energy savings and another category called "other", which consisted of the overhead ARCA charges for the program. Secondary programmatic information such as the site inspection fail rate and number of light bulbs given away was also included.

An interview with a LADWP program coordinator was conducted and emails were exchanged with an ARCA program manager to fill in program details where necessary. The program is straight forward in how it runs and the inputs for the model were generally simple to derive from the provided data.

5.2.1 Labor and goods

LIREP is very simple from a materials standpoint. ARCA's refrigerator procurement switched to all General Electric refrigerators starting in 2012, so all the refrigerators accounted for in 2013 were either 15 cubic foot or 18 cubic foot GE refrigerators. They are all freezer top refrigerators with no extra functionality such as water and ice delivery through the refrigerator door. They are purchased locally and wholesale from GE in Los Angeles County. The input for the model is classified as refrigerator manufacturing, and the total cost of the refrigerators was accounted for in the data provided by LADWP.[12]

The only labor for this program not directly accounted for, and the only potential point of co-investment for this program, arises in the case of a failed site inspection. A failed site inspection can happen for a couple of reasons. First, if the customer's refrigerator does not meet the qualifications to be replaced, that is the end of that application. The other way to fail a site inspection is if the outlet the customer is planning on using for the refrigerator is not grounded. In this case, the customer is given the opportunity to fix the outlet and re-schedule a refrigerator delivery. Replacing the outlet is the only point where outside spending could be added by a customer. The inspection fail rate for the program is less than 5% however, and that includes both disqualified refrigerators and incorrect plugs. Given the low number of plug replacements, and the the high likelihood of a customer replacing the outlet on their own, it was decided for this study to exclude any additional labor costs associated with a potential plug replacement.

5.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

ARCA confirmed that the refrigerators for LIREP are purchased in Los Angeles County at wholesale prices. This is congruent with typical LADWP procurement policies. As mentioned earlier, the CFL light bulbs given away in the program are not accounted for in this model because they were paid for by a different program several years ago. They consequently do not have an economic impact on this model.

5.2.3 LADWP and contractor FTEs

LADWP counts 2.35 FTEs associated with this program. Just over two of those are Utility Service Specialists, and a manager and Senior USS account for the remaining third of one

12 $4.195 million for refrigerators in 2013.

FTE. The job classifications were used along with the LADWP salary database to establish an overhead cost for LADWP for the program.[13]

ARCA provided an FTE count for its employees that work on this program. Local employees include people working dispatch, delivery and in the warehouse. A portion of the ARCA employees are in Minnesota, where the company has their marketing, customer service and call center employees. Having the FTE list allowed us to combine the costs associated with all the different program tasks (e.g. delivery, recycling, site inspection, etc.) into one employee compensation input. We reduced this amount by 5% to account for the out of state employees, who work on this and many other programs ARCA runs. In total, 16.35 direct ARCA and LADWP FTEs were added back in to the model results to help determine the total job-years per million dollars output.

5.2.4 Energy saved

Each refrigerator has an associated level of "energy savings" from which LADWP is able to estimate how much energy savings are created when an old refrigerator is replaced with a new energy efficient one. The savings for this program for the 2013 calendar year were 6.5M kilowatt hours.

The total energy savings for this program came out to $604,672 using a per kilowatt hour cost to the customer of $0.093. An average between the lifeline rate of $0.086 and low-income rate of $0.10 was calculated to arrive at the $0.093 cost of energy to customers. The lifeline and low-income rates came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed.

The money savings from energy savings becomes another input in IMPLAN categorized as household income change. Within this input are choices of income brackets. Household income between $50,000 and $75,000 was used for this study given a median Los Angeles household income of about $56,000.[14]

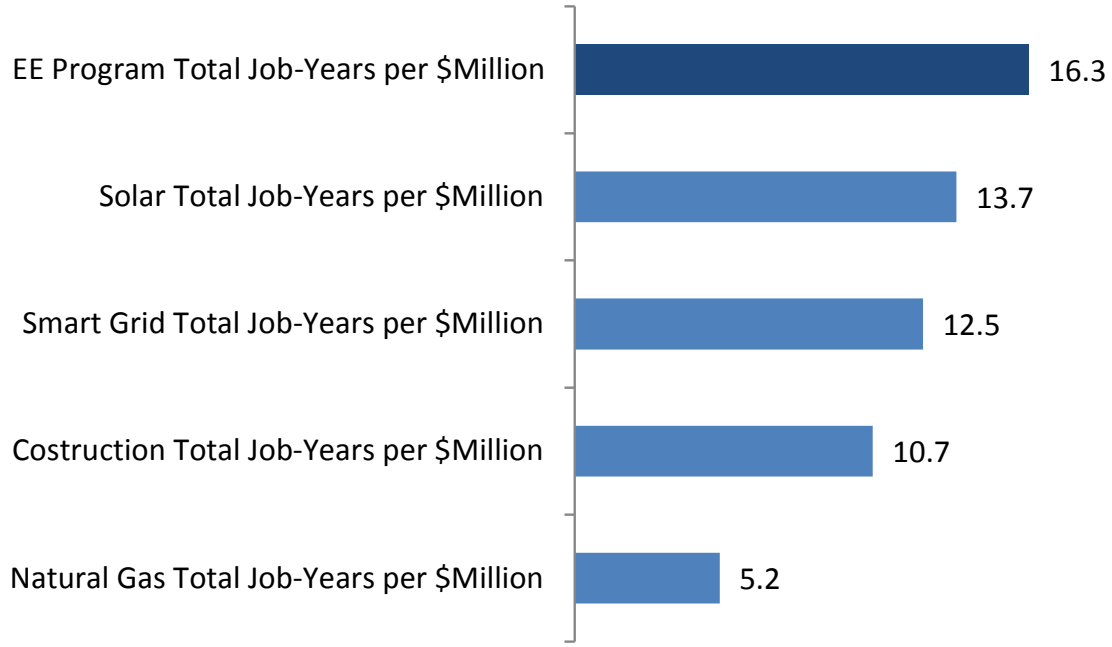
13 LADWP job classes generally have five steps within a class, which progress from the lowest salary (Step 1) to the highest salary (Step 5). For the purposes of this study, step three, which is the median salary, was used as the representative salary when an FTE count did not specify the step within a job class. The salaries found on the website when this study was authored (Spring 2014) were from October 2012.

14 U.S. Census Bureau. *State and County Quick Facts*. n.d. http://quickfacts.census.gov/qfd/states/06/06037.html (accessed February 2014).

6. Consumer Rebate Program

Customer Type: Residential
Intervention Type: Refrigeration, HVAC, Building Envelope and Pool Pumps
Annual Budget: $2,394,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

6.1 Introduction

The Consumer Rebate Program (CRP) is an incentive based program which pays LADWP customers a fixed amount of money for a short menu of items. As the name suggests, this program is intended for residential customers, with the goal of helping consumers choose a more energy efficient option when purchasing certain items. CRP is a mature program with a steady annual amount of participation that does not vary greatly except when LADWP makes extra marketing outreach efforts.

6.2 Methodology

The data on CRP measures purchased and incentives paid out for this model came from LADWP's program tracking software Customer Connect. It consisted of all paid out CRP applications through the first eight months of the 2013-2014 fiscal year. The data was forecast out to a 12-month period and found to be in line with the complete year of data from the previous fiscal year (product quantities and incentives paid out). An interview with a program manager further confirmed that the data for FY 2013-2014 was comparable to previous years, establishing the data set as a good baseline to input into the IMPLAN model.

6.2.1 Labor and goods

CRP incentivizes a number of different energy efficiency measures, and accordingly has more individual inputs than the other programs modeled in this study. Separate materials inputs were created for roofing materials manufacturing, refrigerator manufacturing, air conditioning and heating equipment manufacturing (which includes the three categories of incentivized cooling equipment), windows manufacturing and pump manufacturing. On the labor side, an input was created that covered the construction for the window, AC and cool roof installations. A separate labor input was created for the pool pump/motor installation.

Teasing out co-investment for this program was an involved process. It is typical in many cases where construction work is done (windows, roofs, AC install) for the LADWP to receive copies of invoices or work contracts as proof of an incentivized measure being installed. However, invoices, which generally show the total cost of a job, are not how the program is tracked. CRP tracks incentives by the quantity of a program measure purchased or installed (e.g. 1 Energy Star refrigerator or 500 sq. ft. of cool roofing materials). Various assumptions based on research and interviews were made about installation costs to determine co-investment. Where possible, these assumptions were made with information specific to the Los Angeles County region.

Table 6-1: CRP Menu of Covered Items

Incentivized Measures		Incentive Amount	
Variable speed or variable flow pool pump		$500	
Energy Star rated refrigerator		$65	
Energy Star qualified window product		$2 / sq. ft.	
Energy Star rated air conditioner		$50	
Central air conditioner		Tier 2 - $100 / Ton	Tier 2 - 15 SEER, 12.5 EER
		Tier 3 - $120 / Ton	Tier 3 - 16 SEER, 13 EER
Central heat pump		Tier 2 - $100 / Ton	Tier 2 - 8.5 HSPF, 15 SEER, 12.5 EER
Whole house fans		$200 / unit	
Cool roof	Low-slope (= 2:12)	≥ 78 SRI	≥ 85 SRI
	Steep-slope (>2:12)	> 20 SRI	≥ 35 SRI
	Incentive amount	$0.20/sq. ft.	$0.30/sq. ft.

EER - Energy Efficiency Ratio; SEER - Seasonal Energy Efficiency Ratio; SRI - Solar Reflectance Index

For cool roofs, a price of $5.50 per square foot was used, with labor accounting for $3.50 of that, and $2.00 going to materials. Estimates were seen as low as $2.80 per square foot up to $9.30 per square foot depending on, among other costs, the type of roof being installed, the amount of repairs necessary, removal and disposal of old roofs and warranty. Given that LADWP data does not specify details regarding the type of house or roof, an average price was used, with a slight premium for energy efficient materials.

For variable speed pool pumps and motors, a sampling of prices for qualifying pumps was taken from numerous national pool supply chain websites, and averaged.[15] This came out to $1,367 for the pump. Similar to AC and roof installation, pool service companies prefer to give a bundled price for the parts and labor.[16] In the end, $200 was eventually settled on as the labor cost for installation based on an average of the prices quoted in several interviews with local pool supply companies.

Similar to pool pumps, an average cost of qualifying Energy Star refrigerators was calculated based on prices from the Home Depot website. An average cost of $914 was used for the refrigerators, with no co-investment for labor. Two types of refrigerators were used: Top Freezer and Side by Side. These two types of refrigerators made up the bulk of the refrigerators

15 http://www.poolsupplyworld.com/, http://www.sunplay.com/ and http://www.poolzoom.com/.

16 Interesting side note - the majority of pool supply professionals interviewed mentioned the LADWP rebate when giving their quote.

found in LADWP's data, and appear to be the most popular based on their share of models available on numerous refrigerator and appliance websites.

Air conditioning co-investment was broken into two categories - wall mounted units and central AC – and then summed for input into IMPLAN. An average cost for wall mounted units was calculated from the Home Depot website using qualified medium sized units (9,000 – 12,000 BTU/hour). A cost of $304 per unit was used for materials with an assumption of no installation co-investment.

It was a challenge to break out the labor and material costs for central air conditioning, as contractors typically give a bundled price for the job. An average price of $6,636 was found for an AC install in Los Angeles and a ratio of 65% labor to 35% materials was used for the co-investment.[17] This worked out to $4,313 for labor and $2,313 for materials for each installed measure.

Determining the co-investment for energy efficient windows presented issues similar to cool roofs and air conditioning. A total price of $7.87 per square foot of glass was ultimately used. LADWP pays an incentive based on square feet of glass, while window prices are cited by the window, or based on window dimensions, and contractor estimates for jobs are dependent on numerous variables (making labor/materials difficult to determine). For this study an average price of one-section and two-section windows was found and averaged out, then given a volume discount of 10%.[18] Window installation prices vary greatly depending on the framing material, the number of panes and the quality of the panes. Based on interviews and average window prices observed, a ratio of 50% labor and 50% materials was used for co-investment, making each one ~$3.94.

6.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

For CRP, it was assumed that items were purchased retail. This is congruent with the program design given that it is geared toward the average consumer. A customer will typically become informed about the program at retail locations, for example when purchasing a qualifying refrigerator or pool pump, or from contractors who will mark-up material costs. While it is likely that not all purchases were made in LADWP's service area, it is assumed that all purchases were made in Los Angeles County.

17 http://www.homeadvisor.com/cost/heating-and-cooling/install-an-ac-unit/.

18 One section windows: ≤ 32"x32", 32¼"x32¼" – 58"x58", ≥ 58¼"x58¼".

6.2.3 LADWP and contractor FTEs

The program manager provided an FTE count for CRP, which was used in conjunction with the LADWP salary database to establish an overhead cost for the program.[19] This cost worked out to one third of total program costs, which was in line with the 30% average overhead we were provided as a baseline.

For this program, the only direct FTEs to add back in to the IMPLAN results were the LADWP employees. In total, there were 8.5 LADWP FTEs. Contractors, subcontractors and any other labor that customers paid for were accounted for in the labor inputs that went into the IMPLAN.

6.2.4 Energy saved

Each item on the menu of incentivized measures has an associated level of "energy savings." Within categories there is specification by size, so refrigerators that are 15 cubic feet will have less savings than a refrigerator that is 18 or 20 cubic feet. It is the same with air conditioners, pool pumps and other measures that come in varying sizes.

The annual savings for this program for the 2013-2014 fiscal year was projected to 1.8M saved kilowatt hours. Using a per kilowatt cost to the consumer of $0.135, the total energy savings came out to $244,732. The $0.135 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees and all other non-electricity costs that consumers are billed.

In IMPLAN, this money saved becomes another input categorized as household income change. Within this input are choices of income brackets. Household income between $50,000 and $75,000 was used for this study given a median Los Angeles household income of about $56,000.[20]

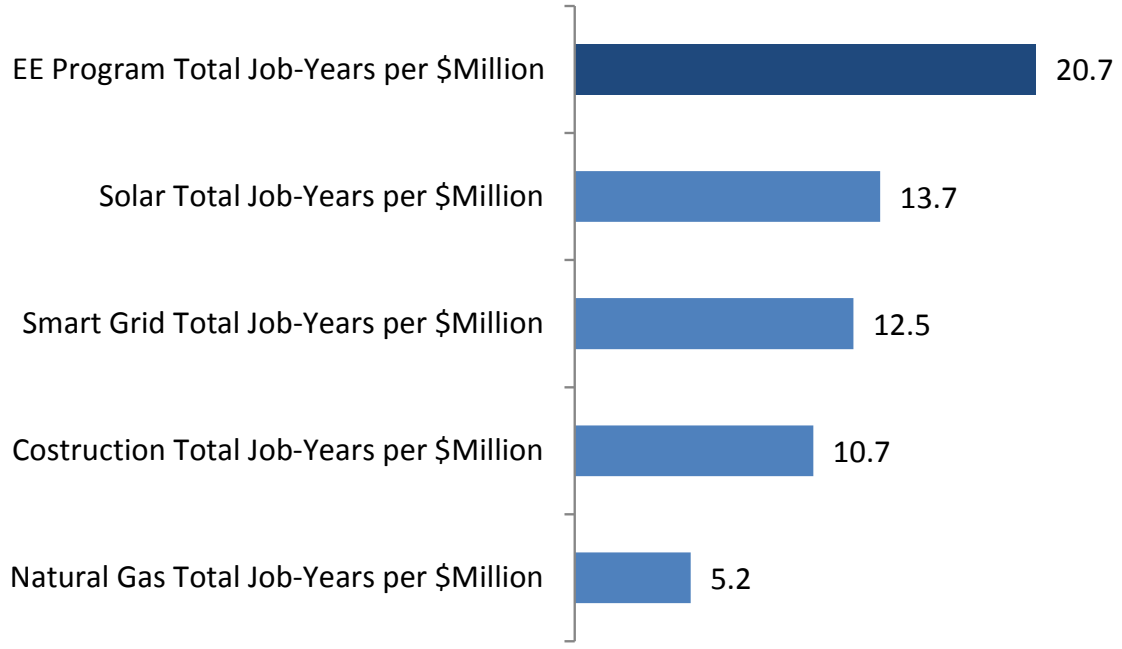
19 LADWP job classes generally have five steps within a class, which progress from the lowest salary (Step 1) to the highest salary (Step 5). For the purposes of this study, step three, which is the median salary, was used as the representative salary when an FTE count did not specify the step within a job class. The salaries found on the website when this study was authored (Spring 2014) were from October 2012.

20 U.S. Census Bureau. *State and County Quick Facts.* n.d. http://quickfacts.census.gov/qfd/states/06/06037.html (accessed February 2014).

7. City Plants Program

Customer Type: Residents and Property Owners
Intervention Type: Shade Trees
Annual Budget: $2,250,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

7.1 Introduction

The City Plants program, formerly called Million Trees LA, provides free shade trees for residential customers and property owners, and plants street trees around the City of Los Angeles. The program is a public-private partnership between the City of Los Angeles, local non-profit organizations, community groups, residents and businesses. LADWP is City Plants' largest sponsor, and with this partnership, City Plants is able to provide, in addition to the trees, important information on where to plant the trees to maximize energy efficiency of buildings.

From the LADWP Business Portfolio Plan:

> The program encourages the planting of California Friendly trees that are adapted to the region's semi-arid climate and that use less water. Native trees and drought tolerant trees that maximize sustainability are recommended. City residents and property owners are eligible to receive up to seven shade trees to plant on their property. Trees must be maintained by the property owner.

Customers are encouraged to plant the trees on the south or west side of their building if possible. Planting trees on these two sides provides shade during the hottest parts of the day. This cooling effect on the building reduces the need for air conditioning in the home, creating instant energy and cost savings.

This program is primarily run by and is principally handled by the LADWP contractor, the Los Angeles Conservation Corps (LACC). LACC procures the trees and related materials, maintains the trees before they are given away and delivers trees. LACC has several sub-contractors that also handle some of the tree requests/giveaways and delivery. Monthly reports on requests, tree purchases, giveaways and other programmatic details are sent to LADWP.

City Plants is a unique program within LADWP's energy efficiency portfolio. While most of the other programs focus on improving the efficiency of a system within a building (i.e. HVAC, lighting) or the actual performance of a building, City Plants improves building efficiency through an external intervention that never touches a building. It is also a much more difficult program to quantify energy savings for.

7.2 Methodology

The data used to analyze the City Plants program came from LADWP and LACC. It consisted of the monthly detailed invoices sent by LACC to LADWP, as well as energy savings numbers and FTE counts from LADWP. LACC invoices include a wide range of programmatic details, including the invoices from all of their subcontractors, a detailed inventory of the trees purchased, other materials purchased and trees delivered for regular residential customers, for special events and for city streets.

A detailed in-person interview was conducted with one of the lead LADWP program managers and follow up conversations were held with a second program manager. To capture further

program details, an in-person interview was conducted with the LACC program manager. The LACC program manager provided complete fiscal year 2012-2013 data, and current at the time of the interview data for fiscal year 2013-2014, (through February 2014). Ultimately the 2012-2013 data was used as the baseline for this program.

City Plants, including its former incarnation Million Trees LA, is a mature program, having been around since 2006. Tree giveaways are simple enough to track by LACC and its subcontractors, and it is the main way by which LACC bills LADWP. Maintaining an accurate count of delivered trees that were actually planted, located on the west or south side of a building within a certain proximity and are still alive and in good condition, is not realistic however. Given the high degree of uncertainty surrounding the condition of the trees once they are delivered by Corps members, the energy savings numbers associated with this program should be understood as a rough estimate.

7.2.1 Labor and goods

The labor and materials accounting for City Plants came from the monthly spreadsheets provided by LACC. The line items were tallied into corresponding groups for labor, materials and vehicle reimbursements. The following figure gives a sample of the items invoiced. The materials included two line items: five gallon trees and stakes, ties and tablets. These two categories ultimately went into one input in IMPLAN, which was accounted for as greenhouse, nursery and floriculture production.

As seen in figure 7-1, labor is broken down into four categories for LACC and its subcontractors: Tree maintenance, tree delivery, delivery ordering/coordinating/recording and program management and staffing. The LACC work force consisted of 10 FTEs, of which 7 were corps members. These are the employees that deliver and maintain the trees. The other 3 FTEs were program management and coordination.

The rest of the labor input for City Plants came from the LADWP labor costs and the City Plants staff housed in Los Angeles City Hall. LADWP has three FTEs dedicated to the program and in the City Plants office in City Hall there are FTEs associated with permitting, grant writing and tree maintenance. For these two groups, job titles or classifications were checked in the Los Angeles City Controller's online database of LADWP and City salaries.[21] These three sources of labor costs were summed to make one labor input in IMPLAN.

21 http://controllergalperin.wix.com/controlpanel.

Figure 7-1: Invoice example

Task		Description
1		Residential Tree Program and materials
	1.1	Purchase of 5 gallon trees
	1.2	Trees Stakes, Ties, Tablets
	1.3	Maintenance of Tree Stock
	1.4	Delivery Coordination, ordering, indexing, recording
	1.5	Delivery of Tree Materials - Delivered
	1.5a	Delivery of Tree Materials - Distributed
	1.6	Management and Staffing - Delivered
	1.6a	Management and Staffing - Distributed
2		Community/Open Space Trees Materials
	2.1	Purchase of 15 gallon trees - MTLA
	2.1a	Purchase of 15 gallon trees - Cal ReLEAF & others
	2.2	Trees Stakes, Ties, Tablets
	2.3	Delivery Coordination, ordering, indexing, recording
	2.4	Coordination and planting
3		Vehicle Reimbursement
	3.1	Monthly Rate
	3.2	Project tools, equipment, and supplies

Like the incentive based programs, 30% was used to determine the total LADWP overhead associated with this program. This amount includes the LADWP labor costs. Also like the incentive programs, City Plants has a co-investment level associated with it. The principal difference around co-investment between this program and the other programs is that with this program it does not come from the people receiving the trees, but rather from grants and other funding sources that the City Plants leadership is able to obtain. The level of non-LADWP funding that City Plants procures can vary from year to year depending on these alternative funding mechanisms. The City Plants program manager at LADWP estimated a level of 70% LADWP funding (30% co-investment). This estimate along with some City Plants documents listing the last three fiscal years' grant funding levels led to the choice of an upper bound of 80% LADWP funding (20% co-investment).

7.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to

customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

For the City Plants program the estimate provided by LACC had 40% of trees coming from nurseries within Los Angeles County, and 60% coming from nurseries in southern California, but outside the county. The margins on these inputs were changed to reflect this fact. The LACC pays wholesale prices for all purchased materials.

7.2.3 LADWP and contractor FTEs

The LADWP program contact provided an FTE count for LADWP employees working on the City Plants program as well as those employees housed in City Hall. The LACC program manager provided an FTE count for all of its employees, but not for its subcontractors. In total, LADWP counts 3 FTEs for the City Plants program and 4.6 FTEs as an entire organization, and LACC counts 10 FTEs. The high number of direct FTEs relative to the budget are consistent with this being a somewhat labor intensive, but primarily low-skilled, program.

7.2.4 Energy saved

Energy savings accounting is at best an educated estimate for this program. When trees are given away the participants are asked where they will be planted in relation to the house, and on what side of the house. Attrition rates and assumptions about whether participants actually did what they said they would do are made, and an energy savings number is estimated for the program.

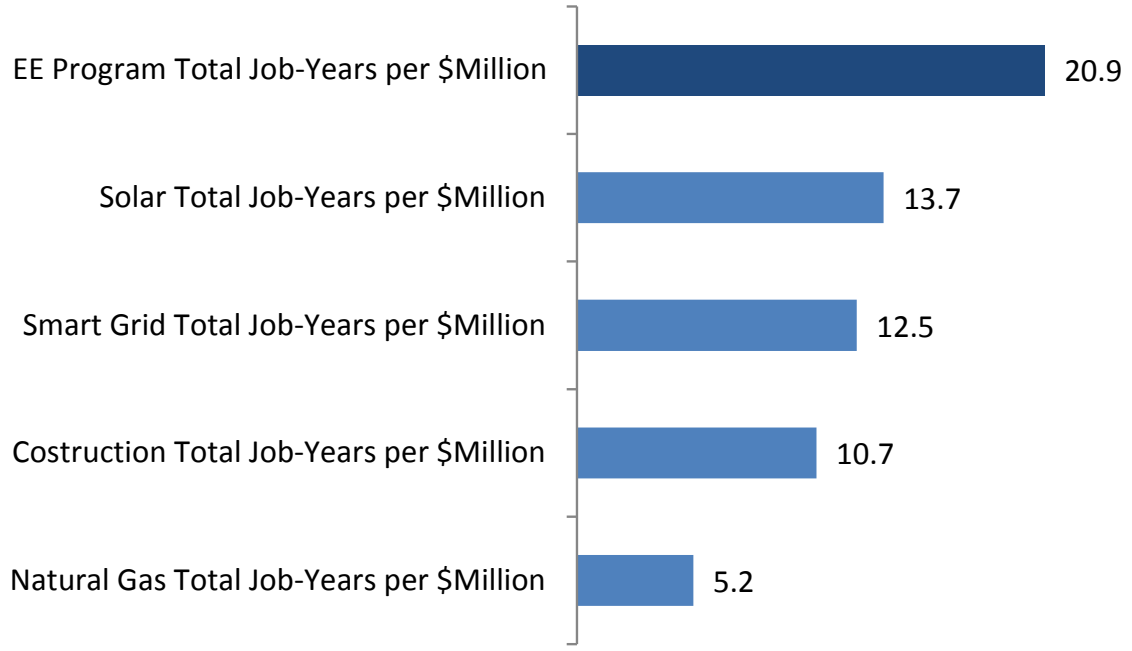
The energy savings number used for this study was taken from the SB 1037 E3 Summary Report that LADWP provided. The estimated energy savings were 1.5 million kilowatt hours and using a per kilowatt cost for residential customers of $0.135, the value of the energy savings came out to $208,588. The $0.135 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed. In IMPLAN, the saved money becomes an input categorized as proprietor income change.

An important caveat accompanying this energy savings number is that a potentially more accurate number is currently being determined through an in depth audit. The new number was not ready at the time of this writing. However, given the relatively small amount of money associated with the energy savings in this model, an increase or decrease in those energy savings would have a marginal effect on the job-year numbers.

8. LAUSD Direct Install Program

Customer Type: Elementary and secondary schools
Intervention Type: Lighting and Equipment Controls
Annual Budget: $11,569,000

Program Jobs vs. Comparable Industries



8.1 Introduction

The LAUSD Direct Install Program is a free direct installation program jointly run by LADWP and the Los Angeles Unified School District (LAUSD) and in partnership with the Southern California Gas Company. It targets schools in the district in need of energy and water efficiency upgrades, addressing lighting systems, including switches and controls as well as water efficiency measures.

This program combines the efforts of the LADWP ISS department and LAUSD's maintenance and facilities crew. LADWP provides design assistance and project management experience along with actually doing retrofits for certain types of interventions. LAUSD is LADWP's largest customer. Given this relationship, a cost and energy saving partnership between the municipal institute and utility has the potential to greatly benefit both parties.

The program started in the last quarter of 2012 and ramped-up significantly in 2013. The projects included in this program can be complex from logistical and technical standpoints and can take three to six months or more to complete. The LAUSD Direct Install Program is important in LADWP's energy efficiency program portfolio, currently budgeted for around 10% of the total energy efficiency program budget. It creates significant cost and energy savings, and is also a strong job creator, both in terms of direct and induced job-years.

8.2 Methodology

The data used to analyze the LAUSD Direct Install Program came from two main sources provided by LADWP. The first is a running weekly report that LADWP keeps on this program broken down by the individual schools being worked on. This report includes information such as the project status, project start and finish dates, LADWP labor, LAUSD labor, invoiced materials and estimated total costs and energy savings. The other main data source is a LADWP report with a more granular break down of labor and materials expenditures for the different types of measures that are installed. This data indicates whether the labor being performed is by LADWP or LAUSD employees, and what type of measures are being implemented.

An in-person interview was conducted with one of the lead LADWP program managers for this program and several phone interviews were conducted with a LADWP management analyst for the program.

For this study, one complete year of data was used. This data did not correspond to a calendar or fiscal year, but captured the program running at full capacity. The parameters by which schools were included in the data set were if the completion date of a project fell within the one-year period, and if LADWP had been invoiced for the materials and labor performed by the Los Angeles Unified School District employees. The following table shows the nine schools where work through the LAUSD Facilities Direct Program was performed and used in this study.

Table 8-1: List of schools that have been retrofitted

Retrofitted Schools in the data set
LA Academy Middle School
Evans Adult School
Lanterman High School
North Valley Occupational Center
El Camino Real High School
West Valley Occupational Center
Glassell Elementary School
Banning High School
Fairfax High School

8.2.1 Labor and goods

This is a direct install program, and once the appropriate schools to include are determined, accounting for the different labor and material inputs is relatively simple compared to incentive based programs with co-investment. There was a fixed amount of money spent on the program, and LADWP reports detail the spending.

The work done for this program is classified into "A" and "B" tasks. "A" tasks are those performed by LADWP and include the actual lighting retrofits: swapping out T12 ballasts and lamps for high efficiency T8s, pole mounted parking lot lights, incandescent fixtures and bulbs to higher efficiency options like LEDs or HIDs, etc. The "B" tasks are performed by LAUSD technicians and include switches and controls. These are items like occupancy sensors and timers among others.

Procurement of all materials for this program is handled by LAUSD, including the materials for "A" tasks that LADWP crews will perform. Per standard LADWP procurement protocol, the materials are purchased locally and at wholesale prices. The detailed material and labor report shows monthly budget numbers by school with "A" and "B" materials shown as line items. These monthly material costs were summed up for the pertinent schools to this study.

The simple scope of systems this program addresses and resulting types of measures performed by LADWP and LAUSD led to three materials inputs for the IMPLAN model. The LADWP materials were categorized into the inputs of fixtures and lamps. The cost for these measures did not categorize ballasts and lamps separately. An 80/20 cost split was used for these measures, the same ratio used in all other programs. The third input was for the sensors and switches installed by LAUSD. This cost, which came directly from the LADWP report, did not need to be further broken down since all the materials fall into one category. The following table reflects the mix of measures installed through this program in terms of total materials spending.

Table 8-2: Measures Mix

Measures	Percentage
Fixtures	33%
Bulbs	8%
Sensors	59%

Labor for the installation of "B" tasks was another line item found on the detailed material and labor report. The number, summed from the per school monthly reports, represents all of LAUSD's labor costs associated with the program, and is fully paid for by LADWP. This labor and material report did not include LADWP labor spending, which was derived by taking the LADWP FTE list with associated job titles and cross referencing it against the LADWP database of salaries. This estimated LADWP labor cost and the LAUSD labor cost were summed up to account for all labor costs associated with this program.

8.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County. As stated in the previous section, this program procures materials within Los Angeles County and at wholesale prices. The margins on the inputs were modified to reflect this.

8.2.3 LADWP and contractor FTEs

FTE counts were provided for LADWP and LAUSD employees involved in this program. This is a labor intensive program and has a correspondingly high number of direct FTEs. LADWP counts 41.5 FTEs in total, which includes about 1 FTE from the program management people in the energy efficiency department, and the rest from the ISS department. These include mostly engineers and electricians. LAUSD has 27 FTEs working on the program, most of who are also electricians. The large number of direct FTEs to add back to the IMPLAN results is consistent with this being a labor intensive direct installation program.

8.2.4 Energy saved

Every measure that LADWP and LAUSD install has an associated level of "energy savings." The annual savings for the one-year period in this study was 9.8 million saved kilowatt hours.[22] Using a per kilowatt hour cost for institutional customers of $0.16, the value of the energy

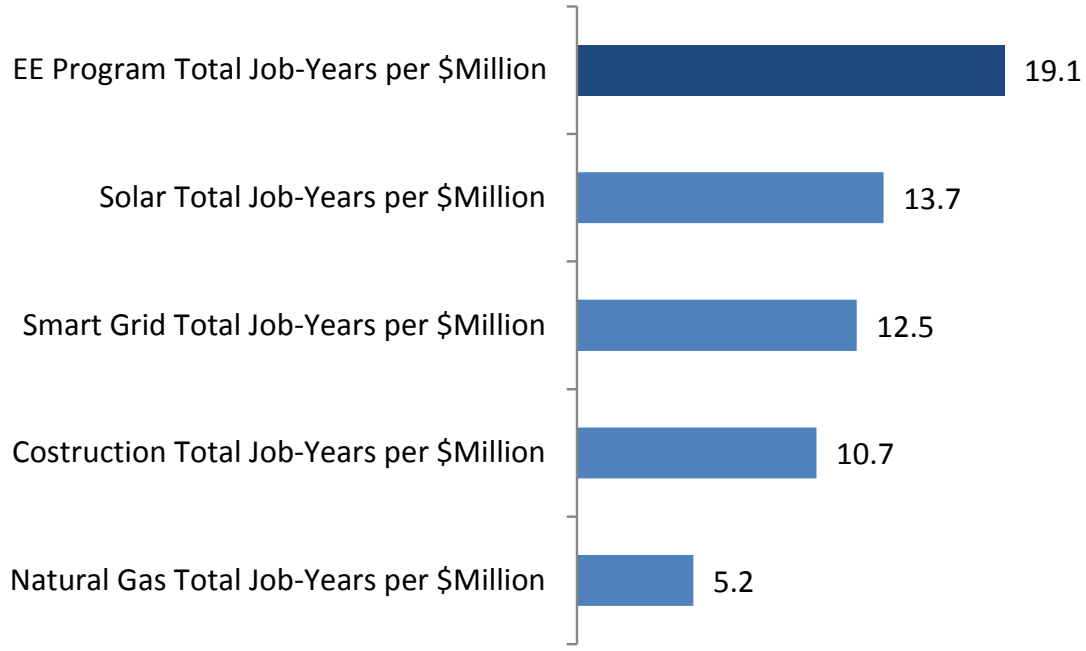
22 This energy savings number came from the weekly report provided by LADWP.

savings came out to $1,575,061. The $0.16 energy cost came from a LADWP energy sales report that took a moving average of total institutional kilowatt hours consumed divided by total institutional revenue. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed. In IMPLAN, the saved money becomes an input categorized as elementary and secondary schools industry change.

9. Commercial Lighting Efficiency Offer

Customer Type: Commercial
Intervention Type: Lighting
Annual Budget: $9,000,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

9.1 Introduction

The Commercial Lighting Efficiency Offer (CLEO) is an incentive based program that pays LADWP commercial customers a fixed amount of money to upgrade their lighting to more efficient options. It has historically been one of the most popular and robust commercial energy efficiency rebate programs in LADWP's energy efficiency portfolio.[23] The incentivized measures in this program each have a set incentive price that was arrived at with consideration for energy savings over a standard measure and the average cost of the measure (material and install).

The menu of items in the program contains a wide variety of high performance lighting measures, including high efficiency fluorescents, CFLs, LEDs and other outdoor pole mounted fixtures. In practice, a large portion of the retrofits consist of some variation of a T12 fluorescent fixture and lamp getting converted to a higher efficiency T8 fluorescent (some variation on a 4 foot fixture). This is attributable to a number of factors. 4-foot and 8-foot T12 fluorescent fixtures were standard in office buildings, warehouses, factories and other commercial structures, so they make up a lot of the stock that needs retrofitting. Additionally, retrofitting one of these fixtures can be simple and cheap, making it a very cost effective intervention. Finally, many of the customers utilizing this program need to get into compliance with California Title 24 standards. Presumably this pattern will change as the old T12 stock diminishes, new Title 24 standards come along and different interventions become more cost effective (such as LED lamps).

This is a mature program that is seeing some changes in the profile of the typical applicant. In past years of the program, bigger jobs that took longer and had more of a profit margin for a contractor made up the majority of projects in the program. Large office buildings or hospitals would do a complete lighting retrofit. Now, with many larger customers already having performed the retrofits to reach Title 24 compliance, the program is starting to see a change in the model according to interviews with the program manager. It is now common to see a contractor bundle many smaller retrofits that can be done quickly. Each business will have to apply individually, but generally the contractor will handle all this paperwork and take the incentive money as payment while the business receives the benefit of the energy savings. The contractor in these cases will earn less on each job, making their profit on volume.

9.2 Methodology

CLEO's data on measures installed and incentives paid out for this model came from LADWP's program tracking software Customer Connect. It contained all CLEO jobs paid out through the first seven months of the 2013-2014 fiscal year with every specific measure listed. The data was forecast out to a 12-month period and found to be in line with a complete year of data from previous fiscal years. An interview with a program manager further confirmed that the data for FY 2013-2014 was comparable to previous years, establishing the data set as a good baseline

23 Los Angeles Department of Water and Power. *Energy Efficiency Portfolio Business Plan FYs 2013/2014 - 2019/2020.* Business Plan, Los Angeles: LADWP, 2014.

for the model. Further interviews were carried out with Trade Allies from this program.[24] The interviews helped to clarify the profile of the typical customer and retrofit. As explained above, this was important in order to make assumptions for the model about labor versus material expenditures and levels of co-investment.

9.2.1 Labor and goods

Sorting out the ratio of labor to material costs for CLEO was the biggest challenge in putting together this model. The Customer Connect data from LADWP provided a good accounting of the mix of measures installed, differentiating between different types of fixtures, sensors and lamps, categorizing the measures into either lighting fixture or lighting control.

For the material inputs in this study, IMPLAN counts fixtures, including ballasts, separately from the lamps. The lighting fixture category in the Customer Connect database of CLEO did not differentiate between fixture and lamp. Lamp, fixture and ballast are rolled into one item in the accounting, as this is how they are incentivized. This accounting is typical for LADWP energy efficiency programs. To accurately reflect costs going to the different inputs, measures that were just lamp interventions, such as LED and CFL lamps, were separated from the overall lighting fixture category. The remaining T8 and HID fixtures and lamps were broken down using an 80/20 cost ratio of fixture to lamp. The mix of measures is seen in the following table:

Table 9-1: CLEO Measure Mix

Measure	% of total incentive expenditure
Sensors	2.2%
Lamps	19.5%
Fixtures	78.3%

Co-investment, typically a very difficult number to tease out, was a known variable for CLEO. In the 2013-2014 fiscal year, LADWP started tracking total job cost along with the total incentive paid out for each application. The data received for CLEO, which was for the first seven months of the fiscal year, showed close to 350 projects paid out. The following table reflects the level of co-investment as a percentage of total projects.

24 The Trade Ally program is used by LADWP to certify that a contractor understands the CLEO program and is capable of doing the work. In return for completing the training and maintaining their business in good standing vis-à-vis the CLEO work they do, a contractor gets their name on a list of qualified businesses by LADWP that interested customers can access.

Table 9-2: Co-investment level

# of Projects	% of total projects	Level of coinvestment
194	55.7%	0
70	20.1%	1%-25%
13	3.7%	26% - 50%
42	12.1%	51%-75%
29	8.3%	>75%
348	**100%**	

Despite 55% of projects paid out having zero co-investment, and over 75% having 25% or less co-investment, the overall ratio came out to 40% co-investment and 60% LADWP expenditures. This ratio is indicative of the impact of bigger projects have on the overall co-investment level. Most of the projects with low co-investment levels range in cost from hundreds of dollars into the low thousands. It is typical for the higher co-investment projects to have a range in the tens of thousands of dollars.

With co-investment and measure mix directly accounted for, the only unclear piece of the CLEO program was the ratio of labor to materials spending. Ultimately, a range reflecting probable low and high bounds on these numbers was calculated for the study.

To arrive at a low bound, the costs of typical measures in the program were researched, and looked at in conjunction with actual invoices from applications provided by LADWP. In some cases contractors charged their clients as low as ten percent for labor. On the high end, labor costs of two thirds of the total job were also seen. The complexity of the measures being installed as well as the addition of interventions outside of the scope of CLEO affected this labor-materials ratio. A low bound of 25% for labor was decided upon, with a high bound of 55%.

9.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased locally or outside of Los Angeles County.

For CLEO, it was assumed that items were purchased wholesale. This is congruent with the way the program generally works. Most of the projects completed in CLEO are done by contractors. It is likely that these contractors purchase the materials at wholesale prices, or a comparable contractor price, as opposed to a standard retail price. While it is likely contractors mark up the price for their clients, the initial sales price will not be retail. For this model it was assumed that all work was done by contractors in Los Angeles County.

9.2.3 LADWP and contractor FTEs

The LADWP program manager provided an FTE count for CLEO. The only direct FTEs to add back in to the IMPLAN results were the LADWP employees. In total, there were 15.4 LADWP FTEs. Contractors, subcontractors and any other labor that customers paid for were accounted for in the labor inputs that went into the IMPLAN.

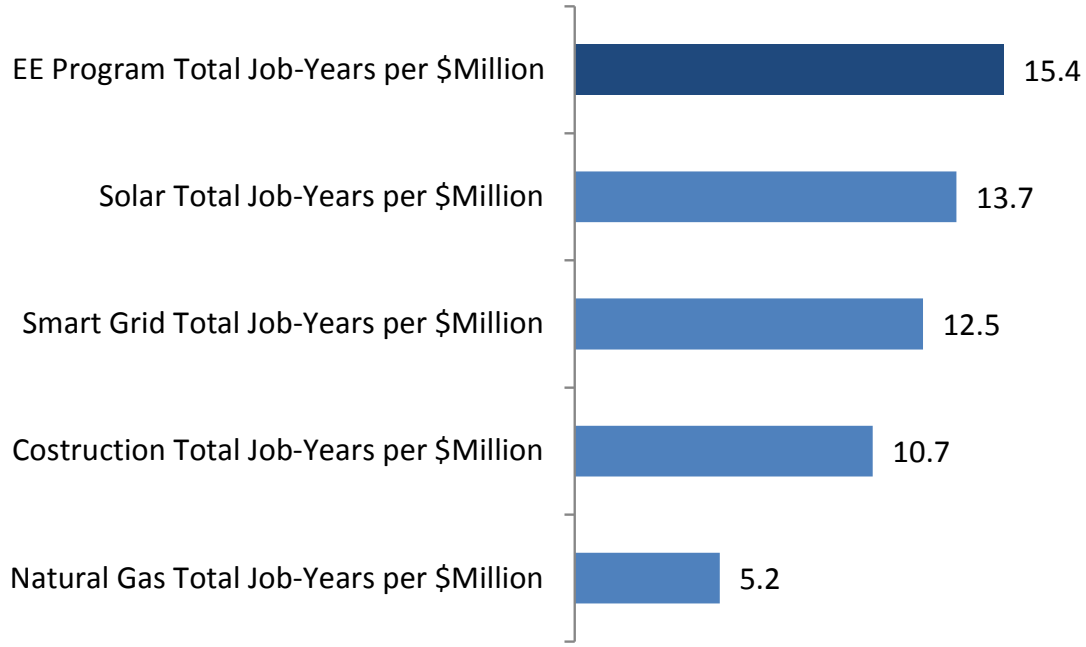
9.2.4 Energy saved

The customers realizing the energy savings are LADWP commercial customers, so this saved money becomes an input in IMPLAN categorized as proprietor income, categorized as proprietor income. Each item on the menu of incentivized measures has an associated level of "energy savings." The estimated annual savings for the program for the 2013-2014 fiscal year was 46.6 million saved kilowatt hours. Using a per kilowatt hour cost for commercial customers of $0.133, the total energy savings came out to $6,193,667. The $0.133 energy cost came from a LADWP energy sales report that took a moving average of total residential kilowatt hours consumed divided by total residential revenue. It is an all-inclusive number, accounting for taxes, fees and all other non-electricity costs that consumers are billed.

10. Custom Performance Program

Customer Type: Commercial
Intervention Type: HVAC, Refrigeration, Building Envelope, Lighting and Controls
Annual Budget: $8,100,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

10.1 Introduction

The Custom Performance Program (CPP) is an incentive based program which pays LADWP commercial customers a fixed amount of money for energy savings attained through a range of measures. This program is custom because it focuses on measures not covered by other existing prescriptive programs, often including those measures that go beyond basic turn-key efforts. Retrofits should help buildings go beyond Title 24 requirements or industry standards, and may include measures such as equipment controls, CO monitoring systems, hotel guest room controls, variable frequency drives, cutting edge high-efficiency lighting technologies and other innovative interventions.

Customers' applications include an energy assessment for their building, which helps to guide and inform what measures will be undertaken in the custom retrofit. The assessment estimates the amount of kWh savings achievable through various proposed interventions, and incentive rates are based on a fixed price per saved kWh. LADWP pays out the incentive to customers only after a post-retrofit on-site inspection is made to verify the work. The following table shows the rates paid for the different types of incentives.[25]

Table 10-1: CPP with incentive rates

Measure	Incentive Level
Lighting, non-targeted	$0.03 / kWh
Lighting, targeted	$0.08 / kWh
Air conditioning and refrigeration	$0.15 / kWh
Other non-lighting	$0.08 / kWh

CPP is a mature program generally focused for the most part on larger structures where deep custom retrofits can help realize substantial energy savings. The program is not limited to these customers, however the smaller commercial customers have more barriers to entry in terms of project financing and getting over the hurdle of an initial assessment. The program mainly attracts customers through targeted outreach by executive account managers at LADWP. At 7.5% of the overall energy efficiency budget, CPP represents an important part of LADWPs energy efficiency portfolio, and it plays an even bigger role in terms of its share of energy savings generated in the portfolio.

10.2 Methodology

The data for measures installed through CPP and incentives paid out for this model came from LADWP's program tracking software Customer Connect. It consisted of all paid out CPP applications through February 2014, which was the first eight months of the 2013-2014

25 Note that these incentive rates are the same as those paid in EETAP. EETAP is a feeder program for CPP, getting customers over the initial assessment barrier.

fiscal year. The data was forecast out to 12 months to create a usable materials input. Several program invoices were obtained from LADWP and directly from a contractor to further verify co-investment levels and labor versus materials costs.[26] Two in-person interviews were conducted with a program manager, and phone interviews were conducted with construction firms that have done work through this program.

Determining the likely levels of co-investment for CPP is difficult. Since the program incentivizes custom work, each project can vary substantially, and each firm hired to perform a retrofit has its own way of doing and charging for work. This variability, uncertainty around what level of co-investment the incentives are actually creating versus what would happen without the incentives, and the insights from interviews and invoices led to the use of a 40% co-investment bound on the low end and 60% on the high end for this model.

10.2.1 Labor and goods

CPP incentivizes a diverse array of energy efficiency measures, and accordingly has more individual materials' inputs in the model than most of the other programs in this study. Inputs included communications equipment were set covering communications equipment, environmental controls, fixture manufacturing, lamp manufacturing, air conditioning and two separate materials/plastics manufacturing measures. The following table shows the categories in which LADWP tracks the different measures performed in CPP and what percentage of the total money LADWP paid in incentives as well as the percentage of the total energy savings created.

Table 10-2: CPP with categories

Categories of EE Measures	% of Inventives Paid	% of Energy Savings
Carbon Monoxide Sensor	0.5%	0.8%
Energy Management System	10%	17.8%
Lighting Fixture	57%	33.3%
Variable Frequency Drive	16%	28.1%
Chiller	1.3%	1.2%
Window Film	8%	9.3%
Packaged Air Conditioning	5%	4.5%
Equipment	3%	4.2%
AC Economizer	0.4%	0.7%
Air Compressor	0.01%	0.01%
Cool Roof	0.1%	0.04%
Total	100.0%	100.0%

26 Invoices provided by LADWP were redacted to omit personal customer information, which was not relevant to this study. The invoices and quotes provided by the contractor were also redacted.

The data from LADWP's Customer Connect software provided the number of measures installed or retrofitted, incentive dollars paid out, and the level of associated savings, but it did not indicate the total cost for materials and installation. The total incentive paid was used as the base number from which to determine total spending, which included co-investment and overhead costs. From this number of total spent, the costs attributed to labor and materials were calculated. In order to come up with the labor and materials costs however, the ratio of materials expenditures to labor expenditures had to be calculated. This was done through aggregating the different invoices and quotes received from LADWP and the contractors and averaging the material/labor splits from all the samples. The sample size of projects was not as large as desired, but represents what was available.

A general pattern, similar to what was seen with the Commercial Lighting Efficiency Offer (CLEO), held that more expensive projects had a more even ratio of materials to labor, while lower cost projects skewed towards smaller margins on the labor. The final ratio used for this study was 43% of costs for labor and 57% for materials. This split is consistent with the nature of the program, which is generally made up of more complex and custom installations that may require more specialized skills and engineering and design.

The labor input was set up using the industry group "maintenance and repair construction of non-residential buildings." One limitation of this set up is that it does not reflect the effects of money spent on labor that might have gone to the engineering and design side. Labor costs seen in the data did not break out this information. Given that the projects done through CPP are deep retrofits, it was assumed that most of the labor went to the actual installing. While the total amount of money spent is accounted for, accounting in this way may have a small effect on the distribution of the multipliers over the different industries. It should not however affect the overall job-year count.

As explained above, teasing out co-investment for this program was difficult. It is typical in many cases where construction work is done (e.g. windows, roofs, AC install, controls) for LADWP to receive copies of invoices or work contracts as proof of an incentivized measure being installed. However, invoices generally show the total cost of a job, possibly split up by materials and labor, but not necessarily by incentive level. This is not how the program is tracked. CPP tracks incentives by the quantity of a program measure purchased or installed, and as it states above, the bounds for what was used in this study were 40% co-investment and 60% co-investment.

10.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

For CPP, it was assumed that items were purchased wholesale. This is likely given that most customers are working with contractors who will be buying in bulk for these projects and not paying retail price. A small percentage share on the margin was allotted to retail sales to account for last minute purchases or any other reason that a purchase may have been retail. It was also assumed that all the purchases for this program were made in Los Angeles County.

10.2.3 LADWP and contractor FTEs

The program manager provided an FTE count for the LADWP employees working on this program. Contractors, subcontractors and any other labor that customers paid for in the retrofitting of their buildings were accounted for in the labor input explained above. Despite the relatively large budget, this program only had 4.2 direct LADWP FTEs to add back in to the IMPLAN results. They included part of a Senior Utility Service Specialist, two Utility Service Specialists and one and a half field support staffers.

10.2.4 Energy saved

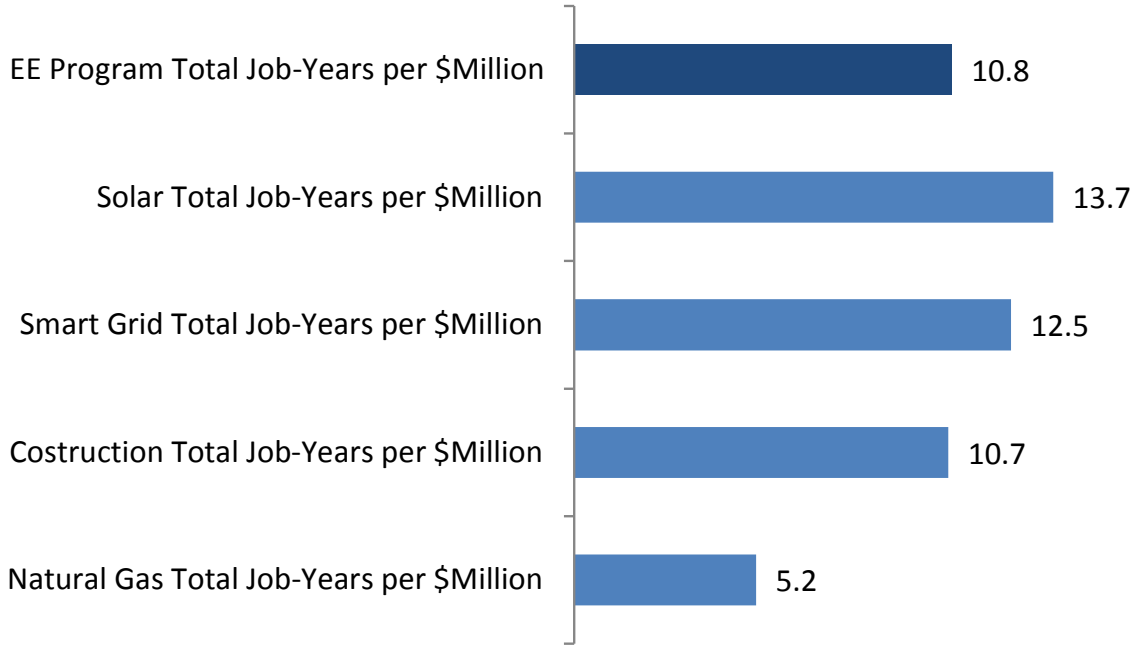
The customers realizing the energy savings for this program are LADWP commercial customers. In IMPLAN, the saved money becomes another input, categorized as proprietor income. To determine this proprietor income, the savings of all the measures accounted for were added up and forecast to one year then multiplied by the average cost of electricity to the customers.

The annual savings for this program for the 2013-2014 fiscal year was estimated to be 38.4 million saved kilowatt hours. Using a per kilowatt hour cost to the commercial customers of $0.133, the total energy savings came out to $5,101,648. This $0.133 energy cost came from a LADWP energy sales report that took a moving average of total commercial kilowatt hours consumed divided by total commercial revenue. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed.

11. LADWP Facilities Upgrade Program

Customer Type: LADWP
Intervention Type: HVAC and Lighting
Annual Budget: $2,865,000

Program Jobs vs. Comparable Industries



11.1 Introduction

The LADWP Facilities Upgrade Program, as the name indicates, is a program designed to improve the energy and water consumption performance of LADWP facilities. The program was established in 2009 in response to the City of Los Angeles Green LA directive.[27] Targeted systems include HVAC equipment, lighting fixtures, plumbing fixtures and irrigation equipment.

The three targeted systems in the program — HVAC, lighting and water — are each managed separately. HVAC and lighting projects are administered by the energy efficiency department, but the water upgrades are performed by the water side of LADWP and accounted for separately. This program is run directly by LADWP, with projects identified and prioritized and subsequently performed by ISS construction personnel.

In addition to setting a good example and precedent of energy efficiency for other City of Los Angeles departments, this program results in reduced electricity and water expenses for LADWP. This ultimately benefits the ratepayer in the form of mitigated costs that otherwise would have been passed along.

11.2 Methodology

This study started with the HVAC and lighting side of the program and did not consider the water efficiency aspect since it is managed and accounted for by a different department. During the research stage of the investigation, it came to light that the HVAC side of the program is unique in its set up, logistically problematic, and the projects undertaken by that team frequently happen over multiple years and in multiple stages. Depending on whether a planned retrofit will be for a central air system or a system of package units, parts of buildings may need to be closed during a retrofit, and a project may start and stop as access and personnel are available. Each project is uniquely specc'd to the facility being worked on, and in the end pulling together a "standard" year of HVAC installation data for this was not feasible.

Conversely, the lighting side of this program was quite straightforward with accessible and modellable data. LADWP has decided for lighting to start with facilities that will be easy to work with logistically, and those that will have a quick pay-back time on the work. This has meant doing lighting retrofits at LADWP warehouses, which are easier to work in than office buildings and facilities associated with the transmission and distribution of water or power.

In-person interviews were conducted with the LADWP program engineers who work on the HVAC and lighting side of the program. The data for the lighting side included all the pertinent information for the model: number of fixtures and lamps installed, costs of fixtures and lamps, ISS labor costs, FTE count and job specifications and energy savings. The data provided was for fiscal year 2012-2013 and 2013-2014. The lighting side of the program significantly ramped-up from 2012-2013 to 2013-2014 and a program engineer indicated that he expected it to ramp-up

27 Los Angeles Department of Water and Power. *Energy Efficiency Portfolio Business Plan FYs 2013/2014 - 2019/2020.* Business Plan, Los Angeles: LADWP, 2014.

more in the coming year.

11.2.1 Labor and goods

The lighting side of the LADWP Facilities Upgrade Program was very simple to account for. Retrofits are performed by LADWP ISS construction personnel, making all the records and reports easily available, and the volume of jobs is quite low, with only two kinds of lighting measures installed. For the 2013-2014 fiscal year, the only retrofits performed were either changing out T12 fluorescent lamps and ballasts for T8 lamps and ballasts, or upgrading outdoor fixtures. Unlike most other programs, the fixtures and lamps were accounted separately for this program, further simplifying the process of defining the material input values for the model.

The data provided for fiscal year 2013-2014 went through February 2014, eight months into the fiscal year. The numbers were forecast out to a one-year period for final use in the model. There is no co-investment associated with this program.

The labor input for this program was equally simple to calculate. The program contact provided the amount that ISS personnel billed the energy efficiency department for work on the program, and this number, like the materials expenditures was forecast to a one-year period. Added to the ISS labor cost was the energy efficiency teams' salary costs, which were derived from matching the FTEs and job titles with the LADWP salary database.

11.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County. Following LADWP procurement policy, the materials purchased for the LADWP Facilities Upgrade Program came from within Los Angeles County and at wholesale prices.

11.2.3 LADWP FTEs

The LADWP program contact provided an FTE count for the program, which was used along with the LADWP salary database to establish an overhead cost for the program.[28] LADWP counts 2.75 FTEs for the program in the energy efficiency department. This includes the part time work of several engineers and one drafter. The other 6 FTEs for this program come from

28 LADWP job classes generally have five steps within a class, which progress from the lowest salary (Step 1) to the highest salary (Step 5). For the purposes of this study, step three, which is the median salary, was used as the representative salary when an FTE count did not specify the step within a job class. The salaries found on the website when this study was authored (Spring 2014) were from October 2012.

the ISS department and include two supervisors and four electricians.

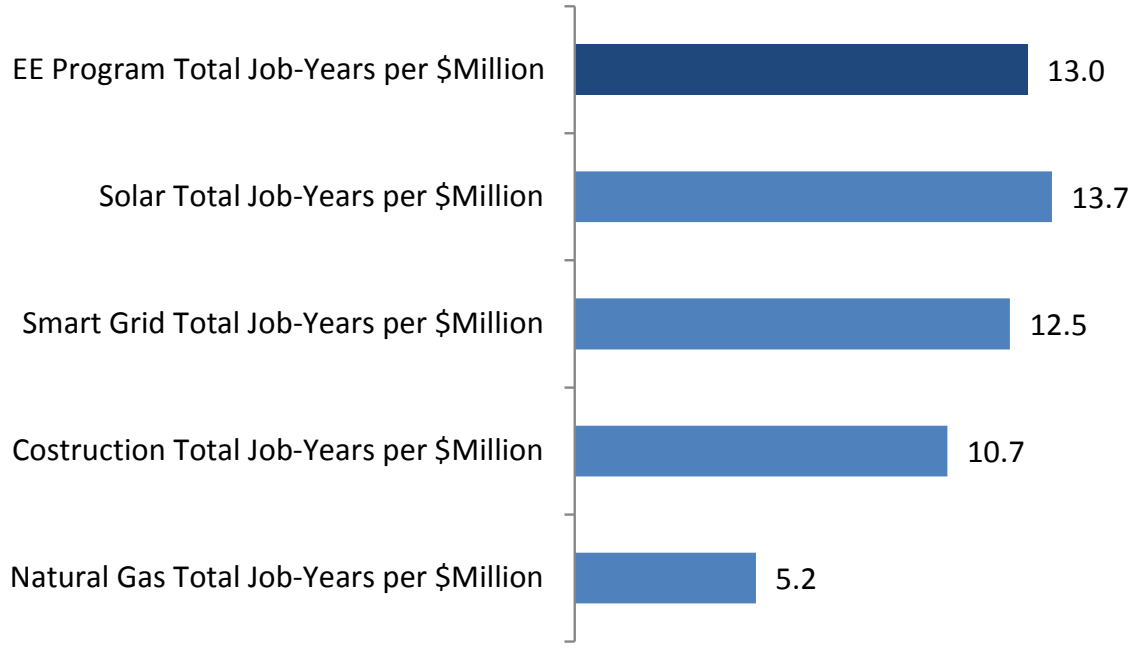
11.2.4 Energy saved

Every measure that LADWP installs has an associated level of "energy savings." The annual savings for the one-year period in this study was 478,188 saved kilowatt hours. Using a per kilowatt hour cost for LADWP of $0.139, the value of the energy savings came out to $66,468. The $0.139 energy cost came from a LADWP energy sales report that took a moving average of total LADWP intra-departmental kilowatt hours consumed divided by total revenue brought in from this segment. It is an all-inclusive number, accounting for taxes, fees, and all other non-electricity costs that consumers are billed. In IMPLAN, the saved money becomes an input categorized as electric power generation, transmission and distribution industry change.

12. Energy Efficiency Technical Assistance Program

Customer Type: Commercial
Intervention Type: Energy Audit
Annual Budget: $5,179,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

12.1 Introduction

The Energy Efficiency Technical Assistance Program (EETAP) is an incentive based program which pays LADWP commercial customers to perform an energy audit on their building. The incentive that LADWP pays is based on the projected kWh savings the audit finds. (See Table 12-1 below) As the name suggests, this program is strictly for technical assistance at the outset of a project, and is a feeder program to the Custom Performance Program (CPP), which incentivizes the actual retrofit. Per LADWP, "these types of projects are typically very unique, are not necessarily scalable to the average customer, and have savings that are a tremendous benefit to these LADWP customers."[29]

Table 12-1: EETAP Incentive Rates

Measure	Incentive Level
Lighting, non-targeted	$0.03 / kWh
Lighting, targeted	$0.08 / kWh
Air conditioning and refrigeration	$0.15 / kWh
Other non-lighting	$0.08 / kWh

The goal of the program is to help customers get over the initial barrier to entry of doing a deep retrofit. The payment of the incentive depends on the level of energy audit. Fifty percent of the incentive for an ASHRAE Level 1 Assessment will be paid out after the audit is completed, and the rest after the actual retrofit is performed. One hundred percent of the incentive will be paid out after the actual retrofit is performed for an ASHRAE Level 2 or 3 Assessment.

EETAP is a new program, launching at the beginning of February 2014. As of the beginning of May 2014, LADWP had received a limited number of applications, and approved the energy audits, but no customers had actually had the audits performed yet. Thus far, the applicants to the program have all opted for an ASHRAE Level 2 or 3 Assessment.

12.2 Methodology

Given the recent launch of EETAP and the lack of data behind the program, the analysis performed here is theoretical. It uses the funding amount found in the LADWP Portfolio Business Plan budget, and assumptions obtained from LADWP about overhead, FTEs and energy savings. Two interviews were conducted with a program manager to understand how the program functions. The key assumptions for this model are that there are no FTEs, overhead, or energy savings associated with the program, because they will be accounted for or accrue to the Custom Performance Program.

The question of co-investment is applicable to this program because it is an incentive model. Estimating an average level of co-investment for this program is not possible at this point,

29 Los Angeles Department of Water and Power. *Energy Efficiency Portfolio Business Plan FYs 2013/2014 - 2019/2020.* Business Plan, Los Angeles: LADWP, 2014.

however initial indications indicate that it is low. According to the program manager, the energy auditing firms linked to program applicants to date appear to be pricing their services around the potential incentive amount for a given building. Given this initially observed tendency for the program, the bounds used in the study are for co-investment of 5% and 25%.

12.2.1 Labor and goods

EETAP incentivizes an energy assessment. Since this is an incentive on a service, there is no actual material cost. The full budget plus co-investment is allocated to the input "architectural, engineering, and related services." This is the only input for the entire model.

12.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

For EETAP, there were no margins to adjust, as the one input is a service. The model being run is regional, so IMPLAN assumes that the service is happening in Los Angeles County.

12.2.3 LADWP and contractor FTEs

As explained above, labor costs on the LADWP side are zero for this model, with its associated programmatic work coming out of the Custom Performance Program budget. Engineers, contractors and any other labor used to perform building energy assessments are captured in the labor input that went into IMPLAN.

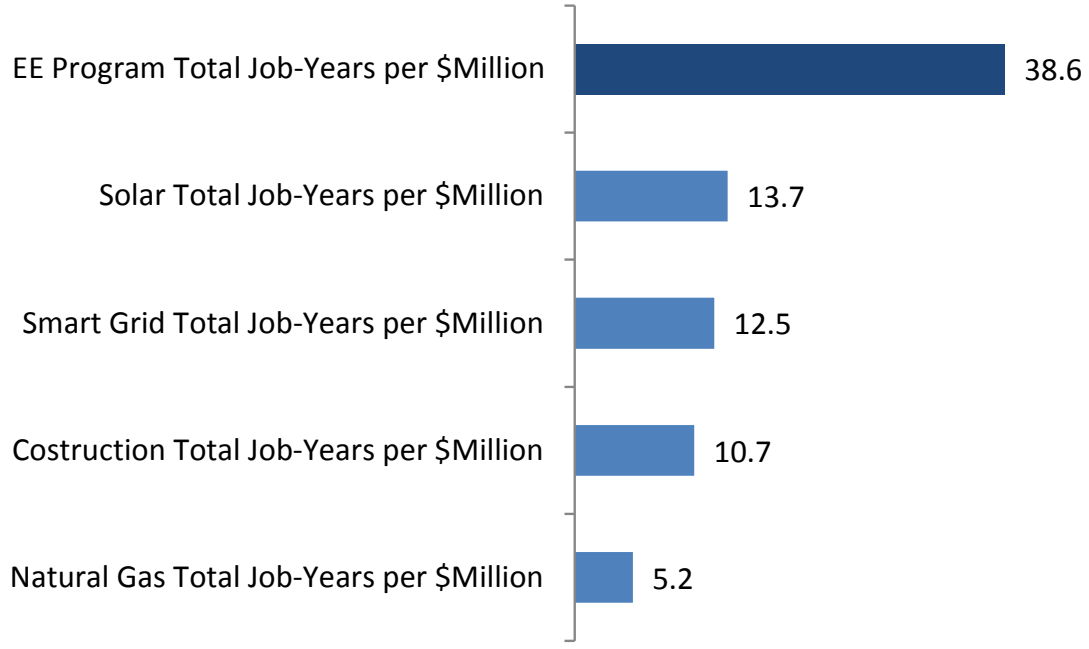
12.2.4 Energy saved

The potential energy savings found in the energy audits performed through this program are only theoretical, while actual energy savings are not realized till a customer proceeds to the Custom Performance Program and performs the retrofit. For this reason, as noted above, there are no energy savings associated with EETAP, and nothing to input in the model.

13. Codes, Standards and Ordinances Program

Customer Type: N/A
Intervention Type: N/A
Annual Budget: $2,000,000

Program Jobs vs. Comparable Industries



Note: A range of job-years created exists for this EE program. The lower bound is displayed.

13.1 Introduction

The Codes, Standards and Ordinances Program (CSO) is distinct from the other programs in this study. It is a cross-cutting program used to improve building and water use efficiency through updated building codes and appliance standards at the state and local level, and improved compliance of already enacted regulations. The program brings together a statewide coalition of all the utilities in California, leveraging their joint economic efforts.[30]

Activities funded through this program include advocacy and participation in state code and standards development with the CEC, CPUC and IOUs (regarding Title 20 and 24). They also include sponsoring local ordinances and capacity training for other city departments that have responsibilities associated with the codes and ordinances (e.g. Los Angeles Department of Building and Safety, Planning, Public Works).[31]

LADWP is a new participant in this multi-stakeholder endeavor, joining this codes and standards team this current fiscal year (2013-2014). However, local and state advocacy around these issues is not new territory for LADWP. It has been involved independently, and with other partners prior to joining this particular statewide coalition.

13.2 Methodology

As a new program, expenditures and other programmatic data for CSO were not available, so the model run for this study is based on the historical percentages allotted to the different program components. (See following Table 13-1) Similar to the Energy Efficiency Technical Assistance Program (EETAP), the analysis performed here is theoretical. It uses the funding amount found in the LADWP Portfolio Business Plan budget, and assumptions gathered from LADWP about overhead, FTEs and energy savings. An interview was conducted with one program coordinators.

Table 13-1: CSO Budget Breakdown

Measure	% of Budget
Building Codes Advocacy	36%
Appliance Standards Advocacy	28%
Compliance Improvement	14%
Reach Codes	6%
Planning & Coordination	15%

This model sees a very large portion of the job creation coming from induced labor, which in this case is principally driven by the energy savings. These savings are reported as savings across LADWP's entire customer base, without specifying percentage share to the individual customer segments. A decision was made for this study to run two models, one specifying an even split of

30 Ibid..
31 Ibid.

the energy savings between residential customers and commercial customers, and one specifying a one-third — two-third residential/commercial customer split.

13.2.1 Labor and goods

The labor inputs for CSO, derived from the five elements in the above table, fit into two industries. Within IMPLAN, *environmental and other technical consulting services* covered the elements of the program geared around studying and writing new building and appliance codes, and *management, scientific and technical consulting services* covered the outreach and compliance aspects of the program. As a new program without historical spending to look at, these inputs were chosen based on assumptions of how the program will run.

13.2.2 Margins on the inputs

Models in IMPLAN start with base assumptions regarding how job and money multipliers work, and across what sectors the invested money will eventually have an effect. The software allows the user to adjust the percentages of certain assumptions about the inputs in order to customize for the specifics of the particular model. Changing these percentages affects how IMPLAN calculates the multipliers. The margins of foremost concern for this study are whether an input was purchased wholesale or retail, and if it was purchased or manufactured locally or outside of Los Angeles County.

There were no margins to adjust for CSO, as the two inputs are services. These services do not have questions around whether they are wholesale nor where they are manufactured.

13.2.3 LADWP and contractor FTEs

CSO is a lean program, with a total of just under one FTE coming from two employees. These two employees will interface with the consulting firms and other utilities and help shape the strategic goals of the program. All other FTEs, from direct consulting services and other indirect sources, are captured in the labor inputs discussed in the previous section.

13.2.4 Energy saved

The energy savings attributed to CSO are by far the largest of any of LADWP's energy efficiency programs, accounting for 71 million saved kilowatt hours in fiscal year 2013-2014. As explained above, two models were run to give a range for the unknown distribution of saved kilowatt hours. For the equal split between residential and commercial savings, an input of $4.39 million went to residential customers and $4.33 million went to commercial customers. For the one-third residential, two-thirds commercial split, the savings were $2.93 million and $5.77 million respectively.

These savings had a very strong impact on the model, creating the large amount of induced labor. The health care system with 4.5 jobs per million dollars and food services with nearly 4 jobs per million dollars, were the top fields for induced labor.

14. Appendix

Table 1. Top Ten Sectors for Small Business Direct Install (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	12.36	-	-	-
319	Wholesale trade businesses	1.3	$105,554	$198,728	$281,173
259	Electric lamp bulb and part manufacturing	0.9	$53,248	$62,535	$4
266	Power, distribution, and specialty transformer manufacturing	0.88	$59,533	$68,518	$16,552
413	Food services and drinking places	0.59	$16,481	$23,709	$39,223
394	Offices of physicians, dentists, and other health practitioners	0.30	$23,710	$24,700	$37,786
335	Transport by truck	0.24	$12,891	$16,203	$33,796
397	Private hospitals	0.22	$20,464	$22,626	$36,656
360	Real estate establishments	0.21	$5,246	$36,103	$42,615
382	Employment services	0.18	$5,489	$6,275	$7,467

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 2. LADWP FTEs and Job Types for Small Business Direct Install

FTEs	Job Type	Estimated Salary
0.2	Utility Services Manager	$145,408.32
0.25	Senior Utility Services Specialist (Supervisor)	$119,016.00
0.4	Utility Services Specialist (Lead)	$109,912.32
0.4	Utility Services Specialist (Lead)	$95,191.92
0.2	General Services Manager	$203,934.96
0.33	Management Analyst	$88,886.16
0.1	Mechanical Engineering Associate	$130,124.16
0.2	Construction and Maintenance Supervisor	$100,662.48
0.2	Plumber Supervisor	$86,839.92
0.8	Plumber	$76,692.24
2.4	Construction Plumbers - Exempt	$84,710.16
5.48	Total FTEs	

Source: http://labrel.ladwp.com/

Table 3: Top Ten Sectors for Home Energy Improvement Program (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	5.37	-	-	-
413	Food services and drinking places	0.48	$13,416	$19,299	$31,927
394	Offices of physicians, dentists, and other health practitioners	0.26	$20,690	$21,553	$32,973
397	Private hospitals	0.19	$17,857	$19,744	$31,986
360	Real estate establishments	0.17	$4,321	$29,738	$35,102
319	Wholesale trade businesses	0.16	$12,713	$23,936	$34,572
398	Nursing and residential care facilities	0.13	$5,620	$6,380	$9,204
324	Retail Stores - Food and beverage	0.12	$4,958	$7,094	$9,119
329	Retail Stores - General merchandise	0.12	$3,981	$6,923	$8,241
426	Private household operations	0.11	$846	$846	$851

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 4. LADWP FTEs and Job Types for Home Energy Improvement Program

FTEs	Job Type	Estimated Wage
0.2	Utility Services Manager	$145,408.32
0.25	Senior Utility Services Specialist (Supervisor)	$119,016.00
0.4	Utility Services Specialist (Lead)	$109,912.32
1.8	Utility Services Specialist	$95,191.92
0.5	Utility Services Specialist	$90,159.84
3.15	Total FTEs	

Source: http://labrel.ladwp.com/

Table 5. ISS FTEs and Job Types for Home Energy Improvement Program

FTEs	Job Type
0.2	General Services Manager
0.33	Management Analyst
2	Senior Clerk Typists
0.7	Mechanical Engineering Associate
0.7	Electrical Engineering Associates
1	Construction and Maintenance Supervisor
4	Carpenter Supervisors
1	Plumber
8	Carpenters
2	Roofers
1	Cement Finisher
12	Utility Pre-Craft Trainees - Exempt
1	Warehouse and Toolroom Worker
7	Maintenance and Construction Helpers
40.9	Total FTEs

Table 6. Top Ten Sectors for Low Income Refrigerator Exchange Program (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	3.20	-	-	-
319	Wholesale trade businesses	0.5	$38,107	$71,745	$101,633
413	Food services and drinking places	0.2	$6,693	$9,629	$15,929
394	Offices of physicians, dentists, and other health practitioners	0.1	$10,195	$10,621	$16,248
397	Private hospitals	0.1	$8,799	$9,729	$15,762
360	Real estate establishments	0.1	$2,382	$16,391	$19,347
398	Nursing and residential care facilities	0.1	$2,767	$3,140	$4,531
382	Employment services	0.1	$1,950	$2,229	$2,652
324	Retail Stores - Food and beverage	0.1	$2,344	$3,354	$4,311
329	Retail Stores - General merchandise	0.1	$1,882	$3,272	$3,896

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 7. LADWP FTEs and Job Types for Low Income Refrigerator Exchange Program

FTEs	Job Type	Estimated Salary
0.05	Utility Services Manager	$156,119.76
0.15	Senior Utility Services Specialist	$119,016.00
2.15	Utility Services Specialist	$95,191.92
2.35	Total FTEs	

Source: http://labrel.ladwp.com/

Table 8. Contractor FTEs and Job Types for Low Income Refrigerator Exchange Program

FTEs	Job Type
4	Dispatch
2	Driver/Helper
2	Contractor
6	Warehouse
14	Total FTEs

Table 9. Top Ten Sectors for Consumer Rebate Program (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	3.62	-	-	-
40	Maintenance and repair construction of residential structures	1.2	$83,048	$107,235	$213,034
413	Food services and drinking places	1.1	$29,883	$42,988	$71,117
394	Offices of physicians, dentists, and other health practitioners	0.6	$46,593	$48,536	$74,252
322	Retail Stores - Electronics and appliances	0.5	$43,029	$69,399	$75,884
323	Retail Stores - Building material and garden supply	0.5	$21,511	$34,285	$44,018
388	Services to buildings and dwellings	0.5	$13,378	$16,985	$28,856
397	Private hospitals	0.4	$40,213	$44,460	$72,029
360	Real estate establishments	0.4	$10,960	$75,432	$89,037
319	Wholesale trade businesses	0.4	$33,844	$63,718	$92,299

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 10. LADWP FTEs and Job Types for Consumer Rebate Program

FTEs	Job Type	Estimated Salary
1	Senior USS	$119,016.00
0.5	Field worker	$81,703.44
6	Utility service specialists	$95,191.92
1	Clerical	$49,590.00
8.5	Total FTEs	

Source: http://labrel.ladwp.com/

Table 11. Top Ten Sectors for City Plants (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	9.81	-	-	-
6	Greenhouse, nursery, and floriculture production	1.17	$168,853.55	$138,306.64	$313,497.40
413	Food services and drinking places	1.17	$31,933.00	$45,936.06	$75,994.55
394	Offices of physicians, dentists, and other health practitioners	0.61	$48,452.32	$50,474.02	$77,216.72
319	Wholesale trade businesses	0.50	$41,562.02	$78,249.87	$112,449.35
397	Private hospitals	0.45	$41,818.50	$46,236.03	$74,906.20
360	Real estate establishments	0.39	$10,658.83	$73,359.54	$86,590.38
398	Nursing and residential care facilities	0.33	$13,159.48	$14,938.64	$21,551.28
324	Retail Stores - Food and beverage	0.28	$11,620.06	$16,624.70	$21,370.63
329	Retail Stores - General merchandise	0.28	$9,326.27	$16,218.80	$19,307.66

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 12. LADWP FTEs and Job Types for City Plants

FTEs	Job Type	Estimated Salary
1	Program Manager	$119,016.00
2	Program Coordinator	$109,912.32
3	Total FTEs	

Source: http://labrel.ladwp.com/

Table 13. Contractor FTEs and Job Types for City Plants

FTEs	Job Type
1	Street Tree Supervisor
1.5	Tree Surgeon
1	Permit Staff
0.1	Forestry Staff
1	Grant Writer
0.25	Program Director
0.75	Program Manager
1	Data Operations Coordinator
1	Crew Supervisor
7	Corps Members
14.6	Total FTEs

Table 14. Top Ten Sectors for LAUSD Direct Install (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	12.26	-	-	-
391	Private elementary and secondary schools	3.8	$175,222	$232,647	$286,283
413	Food services and drinking places	0.57	$16,089	$23,144	$38,288
319	Wholesale trade businesses	0.29	$22,998	$43,299	$62,001
394	Offices of physicians, dentists, and other health practitioners	0.29	$23,123	$24,087	$36,849
360	Real estate establishments	0.25	$6,529	$44,933	$53,037
397	Private hospitals	0.21	$19,957	$22,065	$35,747
398	Nursing and residential care facilities	0.16	$6,284	$7,133	$10,291
324	Retail Stores - Food and beverage	0.14	$5,648	$8,081	$10,388
329	Retail Stores - General merchandise	0.14	$4,534	$7,886	$9,387

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 15. LADWP FTEs and Job Types for LAUSD Direct Install (per $million invested)

FTEs	Job Titles	Estimated Wage
0.2	Utility Services Manager	$153,509.76
0.25	Senior Utility Services Specialist (Supervisor)	$119,016.00
0.2	Utility Services Specialist (Lead)	$109,912.32
0.2	Utility Services Specialist	$95,191.92
0.2	General Services Manager	$203,934.96
0.33	Management Analyst	$75,230.64
0.12	Mechanical Engineering Associate	$130,124.16
1	Senior Electrical Mechanic Supervisor	$113,294.88
3	Electrical Mechanic Supervisors	$96,277.68
24	Electrical Mechanics (18 Civil Servants/ 6 Exempt)	$80,095.68
3	Electrical Helpers – Exempt	$61,491.60
9	Utility Pre-Craft Trainees	$33,408.00
41.5	Total FTEs	

Source: http://labrel.ladwp.com/

Table 16. LAUSD FTEs and Job Types for LAUSD Direct Install (per $million invested)

FTEs	Job Titles
21	Electricians
2	Senior Electricians
2	Electrical Inspectors
1	Area Electrical Supervisor
1	Maintenance Manager
27	Total FTEs

Table 17. Top Ten Sectors for Commercial Lighting Efficiency Offering (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	4.48	-	-	-
39	Maintenance and repair construction of nonresidential structures	2.0	$131,928	$144,709	$299,811
413	Food services and drinking places	1.4	$39,421	$56,708	$93,815
319	Wholesale trade businesses	0.96	$78,115	$147,068	$209,703
394	Offices of physicians, dentists, and other health practitioners	0.70	$56,767	$59,135	$90,467
397	Private hospitals	0.52	$48,996	$54,171	$87,762
360	Real estate establishments	0.44	$11,318	$77,895	$91,944
398	Nursing and residential care facilities	0.38	$15,443	$17,530	$25,290
324	Retail Stores – Food and beverage	0.38	$15,281	$21,861	$28,102
329	Retail Stores – General merchandise	0.35	$12,242	$21,290	$25,345
426	Private household operations	0.32	$2,524	$2,524	$2,538

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 18. LADWP FTEs and Job Types for Commercial Lighting Efficiency Offering

FTEs	Job Titles	Estimated Salary
0.95	Non-Residential Programs Supervisor (SUSS)	$119,016.00
1.95	Program Leads USS A	$109,912.32
0.75	Field Supervisor	$101,247.12
5.25	Field Group	$82,350.72
6	Utility Service Specialists B (Program Managers)	$95,191.92
0.5	Senior Clerk Typist	$59,737.68
15.4	Total FTEs	

Source: http://labrel.ladwp.com/

Table 19. Top Ten Sectors for Custom Performance Program (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
369	Architectural, engineering, and related services	3.96	$412,478	$417,366	$602,928
413	Food services and drinking places	1.12	$31,481	$45,286	$74,919
319	Wholesale trade businesses	1.01	$82,158	$154,680	$219,695
-	LADWP and other FTEs	0.52	-	-	-
394	Offices of physicians, dentists, and other health practitioners	0.48	$39,545	$41,194	$63,020
382	Employment services	0.47	$14,707	$16,813	$20,006
397	Private hospitals	0.37	$34,131	$37,736	$61,136
360	Real estate establishments	0.36	$9,345	$64,316	$75,916
322	Retail Stores - Electronics and appliances	0.28	$25,410	$40,982	$44,886
323	Retail Stores - Building material and garden supply	0.28	$12,796	$20,396	$26,248
398	Nursing and residential care facilities	0.26	$10,754	$12,207	$17,611

[a] all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b] difference between an industry's total output and the cost of its intermediate inputs
[c] represents the value of industry production

Table 20. LADWP FTEs and Job Types for Custom Performance Program

FTEs	Job Type	Estimated Salary
0.7	Senior Utility Service Specialist	$119,016.00
2	Utility Service Specialist	$109,912.32
1.5	Field Support	$82,350.72
4.2	Total FTEs	

Source: http://labrel.ladwp.com/

Table 21. Top Ten Sectors for LADWP Facilities Upgrade (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
-	LADWP and other FTEs	6.52	-	-	-
413	Food services and drinking places	0.52	$14,890	$21,421	$35,437
394	Offices of physicians, dentists, and other health practitioners	0.30	$22,227	$23,154	$35,422
397	Private hospitals	0.22	$19,184	$21,211	$34,362
319	Wholesale trade businesses	0.15	$14,925	$28,100	$40,493
360	Real estate establishments	0.15	$4,431	$30,495	$35,995
398	Nursing and residential care facilities	0.15	$6,040	$6,857	$9,892
324	Retail Stores - Food and beverage	0.15	$5,431	$7,770	$9,988
329	Retail Stores - General merchandise	0.15	$4,360	$7,582	$9,026
426	Private household operations	0.15	$935	$935	$940

[a]all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b]difference between an industry's total output and the cost of its intermediate inputs
[c]represents the value of industry production

Table 22. LADWP FTEs and Job Types for LADWP Facilities Upgrade

FTEs	Job Type	Estimated Salary
1.25	Engineer 3	$111,144.24
1.25	Engineer 2	$130,124.16
0.25	Drafter	$82,350.72
2	Supervisor	$107,845.00
4	Electricians	$85,273.92
8.75	Total FTEs	

Source: http://labrel.ladwp.com/

Table 23. Top Ten Sectors for Energy Efficiency Technical Assistance Program (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
369	Architectural, engineering, and related services	7.1	$736,081	$744,803	$1,075,946
413	Food services and drinking places	0.8	$21,736	$31,267	$51,727
382	Employment services	0.5	$17,310	$19,789	$23,548
394	Offices of physicians, dentists, and other health practitioners	0.3	$20,804	$21,672	$33,155
360	Real estate establishments	0.2	$6,088	$41,902	$49,458
397	Private hospitals	0.2	$17,956	$19,853	$32,163
398	Nursing and residential care facilities	0.1	$5,655	$6,419	$9,261
388	Services to buildings and dwellings	0.1	$3,727	$4,732	$8,039
324	Retail Stores - Food and beverage	0.1	$5,178	$7,409	$9,523
354	Monetary authorities and depository credit intermediation activities	0.1	$12,539	$38,995	$50,977

[a]all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b]difference between an industry's total output and the cost of its intermediate inputs
[c]represents the value of industry production

Table 24. Top Ten Sectors for Codes, Standards and Ordinances Programs (per $million invested)

Sector	Description	Employment	Labor Income[a]	Value Added[b]	Output[c]
375	Environmental and other technical consulting services	6.9	$404,010.50	$429,473.00	$607,591.00
413	Food services and drinking places	3.6	$101,124.50	$145,470.00	$240,658.00
374	Management, scientific, and technical consulting services	2.8	$232,718.50	$242,724.00	$353,458.50
394	Offices of physicians, dentists, and other health practitioners	1.8	$146,763.00	$152,886.00	$233,890.00
397	Private hospitals	1.35	$126,669.00	$140,049.00	$226,892.00
360	Real estate establishments	1.25	$32,068.00	$220,707.00	$260,512.00
382	Employment services	1	$31,651.50	$36,184.00	$43,057.00
398	Nursing and residential care facilities	1	$39,859.50	$45,247.00	$65,276.00
324	Retail Stores - Food and beverage	0.85	$34,880.00	$49,901.50	$64,147.50
329	Retail Stores - General merchandise	0.85	$28,001.50	$48,698.00	$57,972.00

[a]all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income
[b]difference between an industry's total output and the cost of its intermediate inputs
[c]represents the value of industry production

Table 25. LADWP FTEs and Job Types for Codes, Standards and Ordinances Programs

FTEs	Job Type	Estimated Salary
0.5	Engineer I	$130,124.16
0.45	Mechanical Engineer Associate	$130,124.16
0.95	Total FTEs	

Source: http://labrel.ladwp.com/

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