Module 4

CLEAN COALITION

Making Clean Local Energy Accessible Now

Local CLEAN Program Guide

Module 4: Determining Program Size & Cost Impact

June 2012

About the Clean Coalition

The Clean Coalition is a nonprofit organization whose mission is to accelerate the transition to cost-effective clean energy across the United States. The Clean Coalition believes that the right policies will result in a timely transition to clean energy while yielding tremendous economic benefits.

Contact Us

If you have any questions about the Guide or if you are interested in becoming a local champion for a CLEAN Program in your community, please email LocalGuide@Clean-Coalition.org.

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Overview of the Guide

CLEAN Programs create local jobs and investment opportunities.

The Purpose of the Guide

This Local CLEAN Program Guide is designed to help communities and their local utilities evaluate, design, and enact **Clean Local Energy Accessible Now (CLEAN) Programs** based on global best practices and the expertise developed by the Clean Coalition through our work on designing and advocating for CLEAN Programs throughout the United States.

The Structure of the Guide

The Local CLEAN Program Guide is comprised of seven modules.

Module 1: Overview & Key Considerations provides an overview of CLEAN Programs and guides readers through the process of evaluating how a local CLEAN Program will match community goals, resources, and constraints.

Module 2: Establishing CLEAN Contracts Prices provides a roadmap for establishing optimal fixed prices for CLEAN Contracts.

Module 3: Evaluating Avoided Costs provides approaches for determining avoided costs to the utility and/or community.

Module 4: Determining Program Size & Cost Impact explains how to assess the amount of renewable electricity to purchase through a CLEAN Program and determine the associated cost impact, if any.

Module 5: Estimating CLEAN Economic Benefits provides approaches for estimating the local economic value of energy purchased through CLEAN Contracts.

Module 6: Designing CLEAN Policies & Procedures explains how to design streamlined program policies and procedures.

Module 7: Gaining Support for a CLEAN Program describes how to obtain community support and gain official approval for the program.

1) Overview of Program Size and Cost Impact

This module of the Local CLEAN Program Guide provides approaches for determining the program size and associated cost impact of a proposed CLEAN Program.

- The **program size** is the target amount of new local renewable energy capacity to be purchased through a CLEAN Program within a designated timeframe.
- The **cost impact** is the cost premium or cost savings to a utility that can be directly attributed to a CLEAN Program. The cost impact is measured over the duration of the CLEAN Contracts and is generally expressed in terms of the annual **rate impact**, **customer impact**, or **program budget**.

The key design elements of a CLEAN Program (e.g. eligible project types, pricing, program size, and cost impact) are interdependent variables; any constraint on one element will influence or determine the other elements.

- The program size is determined by program goals and constraints. The program size may be chosen based on a designated cost impact limit, procurement goals, the availability of cost-effective project sites, and other major considerations.
- The cost impact of a program depends on the specific program size, the contract price schedule, and the projected premium or savings of the program.

Module 2 of the Guide explains that the program design process involves several stages of estimates, beginning with an initial estimate of contract prices. During this stage, pricing is estimated based on potentially eligible project types and a rough estimate of the program size or several program size options. Once the eligible project types have been defined, the avoided costs of the proposed generation will be evaluated in accordance with Module 3. This analysis will show the cost-effectiveness of different program sizes.

With this information, the program designer can determine the optimal program size in light of the program goals and constraints. If the program constraints include a defined cost impact, then the program size will be calculated accordingly. If the program constraints do not include a defined cost impact, then the program size will be determined in accordance with program goals and the projected market response to the estimated contract pricing.

Table A: Steps for Determining the Program Size:

1) Define eligible project types in accordance with Module 2.

2) Evaluate the avoided costs of the proposed generation in accordance with Module 3.

3) If the cost impact has not been predefined, determine the optimal program size to meet program goals in accordance with Section 2.

4) If the cost impact has been predefined for the program, calculate the optimal program size in accordance with Section 3.

5) Estimate whether the market supply response will support the optimal program size (see Module 2), and adjust the program size accordingly.

Once the program size has been defined, the cost impact of the program can be determined by calculating the cost premium or savings of the program in accordance with Section 3.

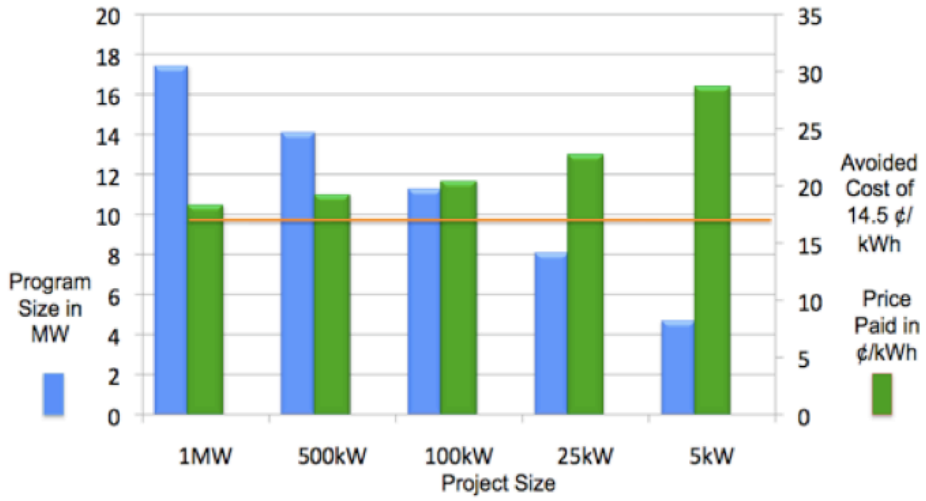
2) Determining Program Size

Designating Capacity Allocations

In addition to determining the total amount of renewable energy to procure in a given period, utility policymakers may also designate capacity allocations for each eligible project type during the procurement period. For example, a utility may choose to ensure that 50% of the solar photovoltaic (PV) capacity is installed on rooftops, or that 20% of the total program capacity is filled by biopower facilities located on farms. In lieu of firm capacity allocations, policymakers may encourage specific project types with tiered pricing.

Each capacity allocation or pricing tier should be considered individually when assessing the potential related costs and pricing. Figure 1 below illustrates how the allocation of the full program capacity to different rooftop solar project sizes affects cost-based pricing in Fort Collins, CO, which in turn impacts the program size at a fixed budget equivalent to a 1% rate increase over the life of the program. Note that value-based prices that are set at avoided cost would have no rate impact, and such value-based CLEAN Programs are not limited in size by cost impact.

Figure 1: Relationship Between CLEAN Program Size and Project Size



Source: The Clean Coalition

Figure 1 was produced with the assumption that all projects are rooftop solar projects at a single project size.

Balancing Program Goals

This section describes how program goals and constraints may influence the total program size and the allocation of capacity to carve-outs or pricing tiers. To ensure that the program is properly designed, policymakers should clearly set the priority of potentially conflicting program goals and constraints.

Maximizing Cost-Effectiveness

Cost-effectiveness is often the controlling factor for determining the program size. If the program will be cost-neutral due to value-based contract pricing, then this factor will not limit the program size. Policymakers generally aim to reduce the short-term cost impact of the program by replacing the existing and planned energy sources that have the highest avoided costs. Table B

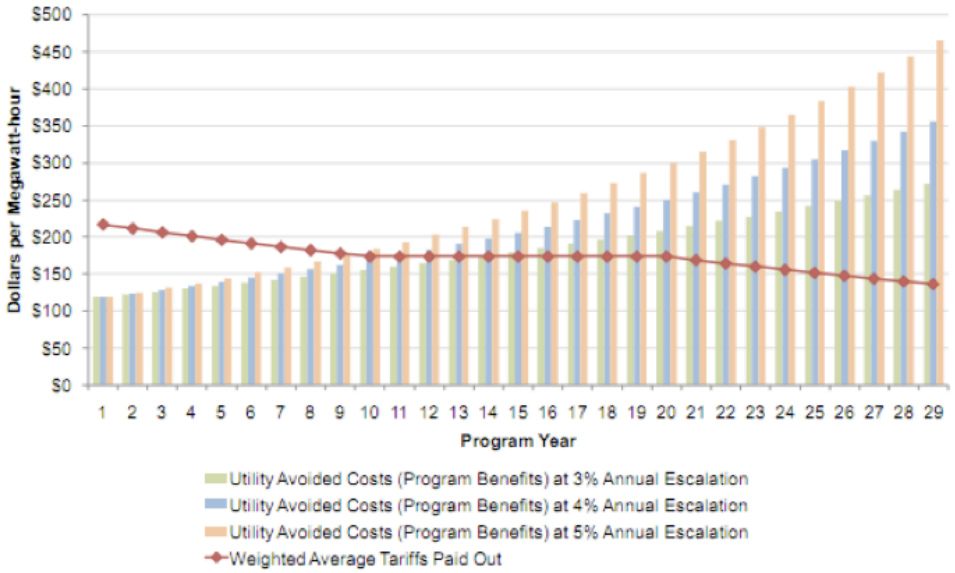
lists the major avoided costs considerations for determining the optimal program size to maximize the cost-effectiveness of the program.

Table B: Avoided Costs Considerations for Program Size:

Type	Description
Energy Portfolio	The utility must maintain a balanced portfolio of resources and contracts to meet its energy needs. Its portfolio will require limited additional procurement to meet projected additional demand and replace old facilities or expiring procurement contracts. Further, once the "low hanging fruit" opportunities have been exhausted, such as avoiding new peaking power plants, expanding the program size can increase the costs of the program.
Location	Energy generation close to load has high locational value, meaning that new generation in these areas will serve local load, which will reduce transmission costs, congestion, energy losses, and infrastructure investments.
Renewable Energy Requirements	To the extent that a utility has not satisfied its requirements to procure renewable energy or Renewable Energy Certificates (RECs), CLEAN energy has additional value. This value should be reflected in an avoided costs calculation. Once a utility has satisfied its requirements, the direct value to the utility of the renewable attributes of the CLEAN energy may be limited to the resale value of the excess RECs.

Cost-effectiveness should be evaluated both in terms of short-term and long-term avoided costs. A short-term cost premium may be necessary to increase cost efficiency in the longer-term. Figure 2 shows how CLEAN Contract prices that include a short-term cost premium may result in substantial cost savings within a few years, as avoided costs begin to exceed the fixed prices paid for CLEAN energy. Further, an initial investment in a robust program will expand the local clean energy market, resulting in economies of scale, lower project costs, and increased competition, which will in turn lead to lower project costs and earlier achievement of avoided cost parity.

Figure 2: Estimated Cost Convergence of the CLEAN Los Angeles Program



Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs [i]

Meeting Renewable Energy & Economic Development Goals

To meet the following program goals, the program should be designed to significantly increase the local utility's procurement of clean local energy:

- Meet or exceed local and state goals for renewable generation and/or greenhouse gas emissions reductions
- Attract renewable energy industry to the locality
- Spur local job creation
- Encourage broad participation in the program
- Create policy certainty for market participants

The program size should be calibrated to match program objectives and the priority of program goals. When designing a pilot CLEAN Program, some policymakers may be inclined to reduce the cost impacts by setting a small initial program size. However, sizing the program too small may cause a program to fail to bring the desired amount of renewable energy online on schedule and achieve the associated economic, environmental, and health goals.

Table C: Projected Impact of Program Size and Capacity Allocation on Direct Employment in Los Angeles County

CLEAN Program Size (MWs)	Exclusive Single Family Program		Exclusive Commercial & Industrial Program	
	Jobs Created	Cost Per Job	Jobs Created	Cost Per Job
100	3,130	$44,438	1,930	$5,656
250	7,825	$40,236	4,825	-$1,158
600	18,780	$38,602	11,580	-$3,808
750	23,475	$38,369	14,475	-$4,186
1,000	31,300	$38,135	19,300	-$4,565

Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs[ii]
Researchers compared the costs of locally-produced solar energy to the cost of new natural gas facilities to meet peak demand.

Policymakers can ensure the success of a pilot program by keeping the pricing and procedures as simple as possible. For example, the staff of the **City of Palo Alto Utilities (CPAU)** proposed the following conditions for the introductory year of the Palo Alto CLEAN Program: (i) the program is appropriately sized to keep the utility on track to meet its renewable energy targets, (ii) only solar projects are eligible initially, although the utility plans to include additional technologies in the future, and (iii) only projects larger than 100 kilowatts (kW) are eligible to participate to limit the number of applications required to meet its first annual target.[iii]

Estimating the Market Response

The optimal program size should be determined based on program goals and the projected market response to contract pricing. If the program goals set the program's cost impact, then the program size will be defined by these constraints, as described in Section 3 below. If the program goals do not include a maximum cost impact, then the program size should reflect the program goals in the order of priority established by the policymakers.

Ultimately, the program size will be constrained by the market response to contract pricing, which will depend on the local supply of renewable energy potential and local project costs. The total procurement level from specific market segments can be estimated with supply and demand price curves. Module 2 explains how to estimate the market response to contract pricing. Table D illustrates how the supply of clean local energy from each market segment varies depending on the offered price.

Table D: Economic Rooftop Solar Potential by Market Segment in Los Angeles County

Tariff per kWh	Megawatts of Potential			
	Gov & Nonprofit	Multi-Family	Single Family	Comm & Industrial
$0.06	0	3	1	12
$0.08	0	16	4	46
$0.10	0	22	10	71
$0.12	0	37	30	108
$0.14	0	66	92	214
$0.16	0	117	241	434
$0.18	1	192	546	817
$0.20	6	309	1,083	1,412
$0.22	11	481	1,859	2,223
$0.24	23	714	2,769	3,143
$0.26	38	992	3,677	4,080
$0.28	73	1,288	4,472	4,987
$0.30	104	1,576	5,106	5,775
$0.32	143	1,841	5,564	6,396
$0.34	185	2,083	5,885	6,902
$0.36	235	2,281	6,104	7,264

Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs[iv]

CLEAN program procedures should include processes for modifying prices based on market response. Generally, well-designed programs require an annual review of market response and authorize policymakers to adjust prices based on the market response. However, programs designed to procure large amounts of new capacity may be designed with a Volumetric Price Adjustment mechanism, as described in Module 2.

3) Determining Cost Impact

The cost impact of a program can be expressed in several ways:

- **Rate impact** is the impact the program will have on electric rates over the duration of the contracts.
- **Customer impact** is the impact the program will have on customer electric bills over the term of the contracts.
- **Program budget** is the total annual cost of the program, defined in terms of a fixed dollar amount or a fixed percentage of annual retail electricity sales.

One of the benefits of a CLEAN Program is that the cost impact is limited to the cost of energy actually delivered. As a result, the utility avoids the costs and risks associated with capital investments in developing, operating, and maintaining energy generating facilities.

Rate Impact

The rate impact of a program is generally expressed as the annual percentage departure from the projected avoided costs of the utility.

The rate impact of a CLEAN Program is calculated by determining the cost premium or savings impact of a CLEAN Program on utility rates over the duration of the contracts. The annual program cost premium or savings is based on the average price paid for energy under contracts issued each year of the program. The following example shows how a CLEAN Program may have no cumulative rate impact; the first year's contracts have an average premium of 0.5¢/kWh over avoided costs, the second year's contracts are priced at exactly avoided costs, and the third year's contracts have an average savings of 0.5¢/kWh. If the program accepts an equal amount of new CLEAN capacity each year, the overall cost to ratepayers will essentially be zero over the course of the three-year program. Appendix A contains an example that shows how to calculate the rate impact of a proposed program size.

Conversely, the program size may determined based on the desired rate impact, as illustrated by the example in Appendix B. This process generally involves several cycles of estimates. The process begins with making rough estimates, and then continues by refining these estimates by adjusting interdependent program design elements (e.g. pricing, avoided costs, program capacity allocations, project types). For example, once the avoided costs of the program have been calculated for each program capacity allocation to a specific project type, these refined avoided costs calculations must be incorporated into a new calculation of the program size based on the rate impact.

Note that if the contract rate for any eligible project type doesn't require a price premium, those contracts will have no rate impact; as a result, the rate impact will not limit the optimal program procurement for such projects.

Customer Impact

The customer impact is the cost impact of the program on customer bills over the term of the contracts. It is generally expressed in terms of the annual percentage or dollar impact on a median or average customer bill (e.g. 1%, 0.5¢/kWh, or $1/month), compared with business-as-usual customer bills. The dollar impact on any individual customer will vary with that customer's

electricity consumption, but the percentage impact will be the same, so long as the rate impact is equally distributed across all customer classifications.

The customer impact of a program may be determined in the same manner as the rate impact is calculated, except that the rate impact must be converted to the percentage or dollar impact on a median or average customer bill.

Program Budget

The program budget is the total annual cost impact of the program, defined in terms of a fixed annual dollar amount or a fixed percentage of annual retail sales. If the utility aims to use a CLEAN Program to meet RPS targets tied to energy sales, then the annual procurement through a CLEAN Program should be adjusted to match projected growth in electrical consumption.

When a program is funded by a percentage of annual retail sales, the program budget automatically increases as retail sales increase. When a program has a defined annual budget, the program size will depend on the average annual price premium or savings for each year of the term of the contracts.

References for Module 4

[i] Los Angeles Business Council and UCLA Luskin Center School of Public Affairs, "Bringing Solar Energy to Los Angeles: An Assessment of the Feasibility and Impacts of an In-basin Solar Feed-in Tariff Program," pg. 35, July 8, 2010, *available at* http://www.labusinesscouncil.org/online_documents/2010/Consolidated-Document-070810.pdf.

[ii] Ibid, pg. 34.

[iii] City of Palo Alto Utilities, "Proposed Renewable Feed-in Tariff Program Summary," October 3, 2011, *available at* http://www.cityofpaloalto.org/civica/filebank/blobdload.asp?BlobID=28879.

[iv] Los Angeles Business Council and UCLA Luskin Center School of Public Affairs, "Bringing Solar Energy to Los Angeles: An Assessment of the Feasibility and Impacts of an In-basin Solar Feed-in Tariff Program," pg. 46.

Appendix A – Calculating the Rate Impact Based on the Proposed Program Size

This appendix provides an example of how to calculate the rate impact of the first year of a pilot solar CLEAN Program, based on the desired first-year program size, for a hypothetical utility.

1) Estimate the program size in terms of the amount of energy to procure (kWh) from each eligible project type during a given year.

Eligible Project Type	Amount of Energy to Procure
500 kW or smaller rooftop solar PV	20 million kWh
100 kW or smaller rooftop solar PV	5 million kWh

2) Determine the **price premium or savings** ($/kWh) per unit of CLEAN energy (kW) for each eligible project type for a given year by subtracting the estimated avoided costs ($/kWh) from the contract rate ($/kWh).

The avoided costs of the utility should be estimated in accordance with Module 3 of the Guide, and the contract rates should be estimated in accordance with Module 2 of the Guide.

Eligible Project Type	Avoided Costs (2012)	Contract Rate (2012)	Price Premium (2012)
500 kW or smaller rooftop solar PV	$0.145/kWh	$0.18/kWh	$0.035/kWh
100 kW or smaller rooftop solar PV	$0.145/kWh	$0.20/kWh	$0.055/kWh

3) Determine the **program budget** ($) for a given year of a program by multiplying the price premium or savings ($/kWh) by the proposed program size (in terms of the amount of capacity to procure) for each eligible project type, and then adding together such amounts.

The total program budget for the one-year program would be $975,000.

Eligible Project Type	Price Premium (2012)	Program Size – Procurement (2012)	Program Budget (2012)
500 kW or smaller rooftop solar PV	$0.035/kWh	20 million kWh	$700,000
100 kW or smaller rooftop solar PV	$0.055/kWh	5 million kWh	$275,000

4) Divide the program budget ($) for a given year by the utility's total projected energy sales ($) for the year to determine the **rate impact** (%).

Program Budget (2012)	Utility Energy Sales (2012)	Rate Impact (2012)
$975,000	$100 million	0.975%

Appendix B – Calculating the Program Size Based on the Desired Rate Impact

This appendix provides an example of how to calculate the program size for the first year of a solar CLEAN Program, based on the desired first-year rate impact, for a hypothetical utility in Colorado. Note that this example shows separate analyses of the program size for a program consisting entirely of 500 kW rooftop solar PV projects and for an alternate program consisting entirely of 5 kW rooftop solar PV projects.

1) Determine the **price premium** ($/kWh) per unit of CLEAN energy (kWh) for a given year by subtracting the estimated avoided costs ($/kWh) from the contract rate ($/kWh).

The avoided costs of the utility should be estimated in accordance with Module 3 of the Guide, and the 2012 contract rates should be estimated in accordance with Module 2 of the Guide.

Project Size	Avoided Costs (2012)	Contract Rate (2012)	Price Premium (2012)
500 kW	$0.145/kWh	$0.18/kWh	$0.035/kWh
5 kW	$0.145/kWh	$0.30/kWh	$0.155/kWh

2) Determine the **program budget** ($) for a given year by multiplying the proposed rate impact (%) by the utility's projected total energy sales ($) for that year.

Assuming that the utility proposes a 1% rate impact for 2012 and estimates $100 million of utility energy sales in 2012, the 2012 program budget will be $1 million dollars.

Proposed Rate Impact (2012)	Utility Energy Sales (2012)	Program Budget (2012)
1%	$100 million	$1 million

3) Estimate the **program size in terms of procurement** (kWh) for a given year by dividing the program budget ($) by the price premium ($/kWh) for that year.

The chart below shows the annual program size based on a given program budget if all projects are the same size.

Project Size	Program Budget (2012)	Price Premium (2012)	Program Size (2012)
500 kW	$1 million	$0.035/kWh	28,571,428 kWh
5 kW	$1 million	$0.155/kWh	6,451,612 kWh

4) Estimate the **program size in terms of aggregate project capacity** (MW) for a given year by dividing the program size in terms of procurement (MWh) by the annual production (MWh/yr) expected per unit (kW) of installed capacity.

The expected annual production by a renewable energy facility may be estimated with software and databases such as the National Renewable Energy Laboratory's System Advisor Model (SAM), described in Module 2.

Project Size	Program Size (MWh) for 2012	Annual Production (per kW installed)	Program Size (MW capacity) for 2012
500 kW	28,571 MWh	1,650 MWh/yr	17.3 MW
5 kW	6,451 MWh	1,550 MWh/yr	4.2 MW

Note that when there are several eligible project types, each category must be analyzed separately, and then the results of each analysis must be aggregated. In other words, if this example program budget were allocated equally between 500 kW rooftop solar PV projects (8.65 MW) and 5 kW rooftop solar PV projects (2.1 MW), then the first year program size would be 10.75 MW.

5) Check the avoided cost values for **accuracy and scalability** in accordance with Module 3 and, if necessary, recalculate the annual program size accordingly.

If the program size calculated above is different from the program size used to calculate the avoided costs, then the avoided costs should be reviewed for accuracy and scalability in accordance with Module 3.

If the updated avoided cost values are higher or lower than the values used to calculate the program size, then the calculations above should be modified to reflect the updated values.

Note that this step is not necessary for making a rough estimate of the program size.

Appendix C – Los Angeles CLEAN Program Size Evaluation

To help the City of Los Angeles assess the feasibility of implementing a solar CLEAN Program, the **Los Angeles Business Council (LABC)** and the **University of California, Los Angeles (UCLA) Luskin Center School of Public Affairs** teamed up to evaluate the City's existing solar capacity and determine how the City's solar resources could be utilized in the most cost-effective manner.[i] Researchers acknowledged that the program's overall size was a very important factor in this analysis because it would ultimately determine how much renewable energy was procured. In turn, the amount of renewable energy procured would affect the associated environmental benefits, the number of local jobs created, the related economic benefits, and the ratepayer impact.[ii]

The researchers distinguished the solar potential by both project size and by market segment, as shown in Tables 1 and 2.

Table 1: Rooftop Solar Potential by Project Size in Los Angeles County

Project Size	Zero	1-5 kW	5-10 kW	10-50 kW	50-500 kW	500-1,200 kW	1,200+ kW	Total
MW	0	1,994	3,504	4,565	5,422	1,888	1,740	19,113
Parcels	360,080	675,475	498,964	263,256	40,756	2,505	858	1,841,894

Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs[iii]

Table 2: Rooftop Solar Potential by Market Segment in Los Angeles County

Market Segment	Gov & Nonprofit	Multi-Family	Single Family	Commercial & Industrial	Total
MW	450	3,336	6,741	8,586	19,113
Parcels ≥ 1 kW	8,849	227,790	1,142,578	102,597	1,481,814

Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs[iv]

Next, the researchers estimated the response of each market segment to a range of contract prices, the results of which are in Table 3.

Ultimately, the research demonstrated that a well-designed, appropriately sized CLEAN Program would help the city of LA achieve its environmental and economic goals with a limited ratepayer impact.[v]

Table 3: Economic Rooftop Solar Potential by Market Segment in Los Angeles County

Tariff per kWh	Megawatts of Potential			
	Gov & Nonprofit	Multi-Family	Single Family	Comm & Industrial
$0.06	0	3	1	12
$0.08	0	16	4	46
$0.10	0	22	10	71
$0.12	0	37	30	108
$0.14	0	66	92	214
$0.16	0	117	241	434
$0.18	1	192	546	817
$0.20	6	309	1,083	1,412
$0.22	11	481	1,859	2,223
$0.24	23	714	2,769	3,143
$0.26	38	992	3,677	4,080
$0.28	73	1,288	4,472	4,987
$0.30	104	1,576	5,106	5,775
$0.32	143	1,841	5,564	6,396
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$0.36	235	2,281	6,104	7,264

Source: Los Angeles Business Council (LABC) and University of California, Los Angeles Luskin Center, School of Public Affairs[vi]

References for Appendix C

[i] Los Angeles Business Council and UCLA Luskin Center School of Public Affairs, "Bringing Solar Energy to Los Angeles: An Assessment of the Feasibility and Impacts of an In-basin Solar Feed-in Tariff Program," pg. x, July 8, 2010, *available at* http://www.labusinesscouncil.org/online_documents/2010/Consolidated-Document-070810.pdf.

[ii] Ibid, pg. xi.

[iii] Ibid, pg. 43.

[iv] Ibid, pg. 44.

[v] Ibid, pg. x.

[vi] Ibid, pg. 46.