



GO SOLAR LA

Solar in the Southland

**The Benefits of Achieving 20 Percent
Local Solar Power in Los Angeles by 2020**



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Local Solar Power in Los Angeles by 2020

Environment California
Research & Policy Center

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Executive Summary

As anyone who has flown into Los Angeles International Airport knows, the city has a staggering amount of flat, empty roof space. For an average of 260 days each year, the sun bathes those rooftops in virtually endless amounts of light. However, most of that energy goes unused. Only one percent of Los Angeles's electricity currently comes from solar power.¹

More than any other city in the country, Los Angeles could benefit from a robust market for rooftop solar power on homes, office buildings, schools, warehouses, parking lots, and more. Solar power can benefit our environment, our health and our economy—providing cleaner air, reducing global warming, conserving water and creating jobs.

To capture these benefits, Los Angeles's leaders should adopt a visionary goal of installing 1,200 megawatts of local solar power generation capacity by 2020.

Powering Los Angeles with 1,200 megawatts (MW) of local solar power would help clean the air and reduce global warming pollution.

- Reaching this goal would prevent the annual emission of over 1.1 million

metric tons of global warming pollution, which is comparable to eliminating the tailpipe emissions of 230,000 passenger vehicles.

- In addition, installing this amount of solar power would prevent the emission of over 730,000 pounds of smog-forming pollution per year.

Building 1,200 MW of local solar power would conserve valuable water.

- Solar panels generate electricity without using any water beyond that needed for occasional washing.
- If 1,200 MW of rooftop solar displaced electricity generated from natural gas power plants, it would save an estimated 435 million gallons of water per year.²

Installing 1,200 MW of local solar power would create jobs and save Angelenos money.

- Building 1,200 MW of local solar by 2020 would create approximately

32,000 job-years of employment. To put this number in context, the University of California, Los Angeles—which ranks among the city’s leading employers—has a workforce of just under 32,000 people.

- Incentives have made it possible for the Los Angeles Unified School District to invest in a solar energy system that, when complete, will save an average of up to \$800,000 each month in electricity costs. Offering continued incentives will enable more Los Angeles consumers to bring their energy bills down to zero, or near zero, saving significant money over the long run.

Building 1,200 MW of local solar power in Los Angeles by 2020 is an achievable goal.

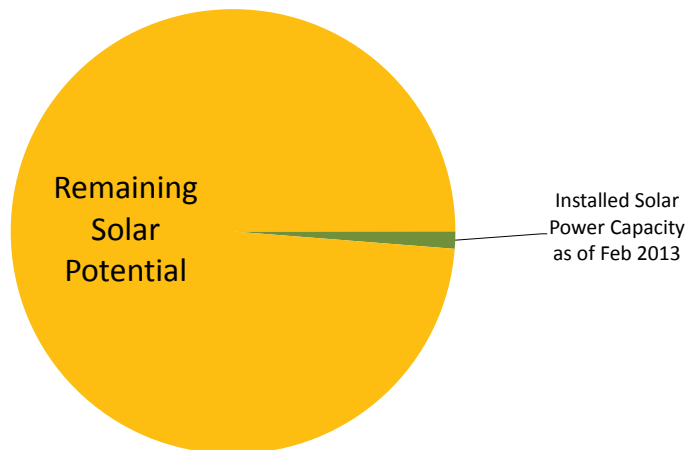
- Los Angeles rooftops could hold an estimated 5,500 megawatts (MW) of solar panels.³ Those panels could produce enough electricity to power 1.3 million homes.⁴

- 1,200 MW is approximately 20 percent of the Los Angeles Department of Water & Power’s (LADWP) summertime peak energy needs.⁵ This much local solar energy could power approximately 300,000 Los Angeles homes.⁶
- Twelve hundred megawatts also represents LADWP’s load-proportionate share of Governor Brown’s goal of installing 12,000 MW of local clean power across the state by 2020.

To achieve this goal:

- The Mayor and the City Council should provide clear, strong and consistent direction and support to LADWP to achieve the 1,200 MW local solar power goal and secure the city’s clean energy future.
- LADWP should fully implement and maintain the integrity of the 150 MW feed-in tariff program by 2016 and expand the program to achieve 600 MW by 2020.

Los Angeles’s Rooftop Solar Potential



Los Angeles rooftops could hold an estimated 5,500 megawatts (MW) of solar panels, of which a mere fraction has been utilized. As of the end of February 2013, LADWP had installed 68 MW under the Solar Incentive Program.



This residential solar array overlooks the downtown Los Angeles skyline. Credit: Graham Owen, Ameco Solar

- LADWP should meet and exceed the 280 MW capacity goal originally set forth for the utility under California’s Million Solar Roofs Initiative (SB 1). The utility can achieve and exceed this goal by providing expanded rebates for Angelenos to go solar on their own homes and businesses, as well as expand consumer access to net metering.
- LADWP should diversify the city’s solar energy consumer base. For example, LADWP should create policies specifically designed to help non-profit consumers who cannot take advantage of federal tax credits for solar energy systems, renters or those whose roofs are not well suited for solar power, and low-income consumers.
- LADWP should standardize and accelerate methods for permitting and interconnection procedures.
- LADWP should work with consumers and solar installers within LADWP territory to improve communication and the transparency of the utility’s solar programs.
- City leaders should continue to support efforts to improve the quality and expand the reach of green job training programs in Los Angeles to train the next generation of local workers to help build the city’s clean energy future.

Introduction

Solar energy makes perfect sense for Los Angeles.

Solar energy is clean, safe and smart. Environmentally, solar energy reduces the air pollution caused by burning coal, gas or oil to generate electricity—including pollution that contributes to global warming. Economically, solar energy helps break our costly dependence on fossil fuels and creates local jobs that cannot be outsourced.

Los Angeles has all of the ingredients necessary to become the solar power capital of the nation: an abundance of sunshine; leading solar innovators; one of the nation's most ambitious mandates to reduce global warming pollution; and strong coalitions of government, business and nonprofit leaders.

Los Angeles also has a publicly-owned utility, the Los Angeles Department of Water & Power (LADWP), which is subject to public control. And, LADWP customers want more of their power to come from the sun. In a 2012 poll, more than 85 percent of responding LADWP customers agreed that more of the utility's energy should come from solar power. Nearly

three-quarters of respondents wanted at least half of the city's electricity supply to come from renewable energy.⁷

Other California cities are showing how to get the job done. San Diego is leading Los Angeles in terms of its total number of rooftop solar energy projects. Smaller cities like Santa Rosa and Clovis have 10 times more solar generation capacity per capita than Los Angeles.⁸

Now is the time for Los Angeles to commit to a solar-powered future. State law mandates that LADWP must end its reliance on coal, which currently accounts for approximately 40 percent of the city's electricity supply.⁹ The city's own plan will result in a coal-free Los Angeles by 2025—two years ahead of the state's deadline.¹⁰ At the same time, LADWP will either need to retire or modify its gas-fired power plants—which currently account for 17 percent of the city's electricity supply—to comply with federal clean air standards and state restrictions on the use of once-through cooling technology, which is harmful to fish and aquatic ecosystems, and wastes limited water supplies.¹¹ In addition, the extended shutdown of the San

Onofre Nuclear Generating Station is a reminder that nuclear power is inherently unreliable and unsafe and highlights the utility's need to shift away from nuclear power as well. LADWP currently gets 11 percent of its energy from the Palo Verde Nuclear Generating Station in Arizona, which has also experienced setbacks in recent years.¹²

As a result of the challenges primarily facing LADWP's fossil fleet, the city will be replacing or repowering 70 percent of its current energy supply over the next 15 years.¹³

Los Angeles leaders should respond to these challenges by setting and achieving a visionary goal for generating power from

the sun on rooftops within the city, rather than simply building new in-basin fossil fuel plants that would lock Angelenos into a reliance on dirty power for decades to come.

This report presents the potential benefits that Los Angeles could attain for its environment and citizens by building 1,200 megawatts (MW) of local solar power by 2020. Powering Los Angeles with sunlight can transform our economy, generate jobs, protect our health and preserve our environment for generations to come.

LADWP is the nation's largest municipal utility, significant on the world stage. Its leadership on solar power—and the broader clean energy transition—will be crucial not only for California, but also for the planet as a whole.¹⁴



This residence in the Mar Vista area of Los Angeles benefits from a 3.9 kW thin-film solar array.
Credit: John Ayers

Los Angeles Has Immense Potential for Solar Energy

Solar power is Los Angeles's greatest untapped energy resource. Los Angeles averages more than 260 days of sunshine per year.¹⁵ As UCLA's Luskin Center for Innovation has detailed, the city of Los Angeles has over 5,500 MW of rooftop solar energy potential, or the potential to power over one million homes.¹⁶

As of February 2013, only about one percent of that potential has been realized with 68 MW of rooftop solar energy installed in Los Angeles.¹⁷ By capitalizing on a mere 1,200 MW of the city's potential, Los Angeles could power approximately 300,000 homes with clean energy, reduce its dependence on dirty sources of energy, create cleaner air for all, reduce global warming pollution and create local jobs.

Solar Power Can Help Clean the Air and Reduce Global Warming

Solar energy technologies are a powerful solution to reduce the environmental damage caused by our dependence on fossil fuels. Solar energy is clean and safe. It does not contribute to global warming or create health-threatening air pollution, unlike traditional fossil-fired power plants.

Solar Power Reduces Smog-Forming Pollution

Solar power displaces electricity that would otherwise come from power plants fired by coal and natural gas, helping to reduce smog. This is particularly true because solar panels generate the most electricity on hot summer afternoons when electricity demand is at its highest and smog pollution at its worst. Instead of having to rely on peaking natural gas power plants that are typically dirtier than larger natural gas power plants, Los Angeles can increasingly turn to solar power.

Every megawatt of solar power installed in Los Angeles prevents the emission of



Solar energy systems can benefit all areas of Los Angeles, from the eastside to the west, from the Valley to San Pedro. This solar array creates clean energy against the backdrop of the twin ports of Long Beach and Los Angeles. Credit: Patrick A. Redgate, Ameco Solar

an estimated 610 pounds of smog-forming pollution per year.¹⁸ Installing 1,200 megawatts of solar power in Los Angeles would prevent the emission of over 730,000 pounds of smog-forming pollution annually.¹⁹ This would have an impact comparable to eliminating the tailpipe pollution of nearly 70,000 passenger vehicles.²⁰

Reducing air pollution can improve our health and the quality of life in Los Angeles. Because of fossil fuel pollution, the American Lung Association ranks Los Angeles and neighboring Long Beach and Riverside as the most polluted metropolitan area in the United States in terms of high ozone days.²¹ Exposure to ozone pollution, or smog, can reduce lung function, trigger asthma attacks, create other

respiratory problems, and cause eye and throat irritation.²²

Approximately 1.2 million children and adults in Los Angeles County have been diagnosed with asthma,²³ including 63,000 Los Angeles Unified School District students.²⁴ At the same time, Los Angeles County senior citizens are at a greater risk than residents of any other county in the country to die prematurely as a result of air pollution-related illnesses, with an estimated 10 percent of deaths resulting from air pollution.²⁵ These and other air pollution-related health problems result in \$23 billion of costs each year in the South Coast Air Basin, which includes Los Angeles, Orange, Riverside and San Bernardino Counties.²⁶

Solar Power Fights Global Warming

Solar power can play an important role in reducing global warming pollution. As neighborhoods get more and more of their electricity from solar, they consume less energy from gas-fired power plants, reducing global warming emissions. Every megawatt of solar power installed in Los Angeles cuts global warming pollution by approximately 916 metric tons per year.²⁷ Installing 1,200 megawatts of solar power in Los Angeles would prevent the annual emission of about 1.1 million metric tons of global warming pollution, which is comparable to eliminating tailpipe pollution from 230,000 passenger vehicles, or about 2 percent of the city's total annual emissions of global warming pollution.²⁸

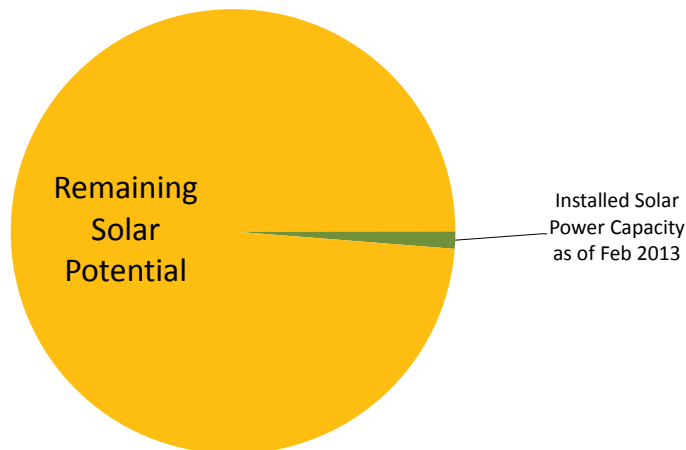
Solar photovoltaic (PV) systems dramatically reduce emissions of global warming pollutants compared with fossil fuels, even when the emissions created in the manufacturing of the PV systems are included. For some PV technologies, life-cycle emission reductions are as high as 89

to 98 percent.²⁹ According to the U.S. Department of Energy, the “energy payback” time for a PV system—the amount of time it takes to save as much energy as was used to produce the system—ranges from three to four years and is decreasing over time. Assuming a system lifetime of 30 years, a photovoltaic panel yields 26 to 27 years of true fossil fuel-free electricity.³⁰

Reducing global warming pollution should be an urgent priority for Los Angeles and the rest of the nation and world. Reducing pollution can help to limit the impacts of warming. While some of the impacts of warming will be unavoidable at this point, we are in control of how bad it could get.

Without action, average temperatures in the Los Angeles area will rise between 3-5 degrees Fahrenheit by mid-century, tripling or quadrupling the number of days with high temperatures above 95 degrees.³¹ This increase in temperatures will make air pollution worse, while exposing Angelenos to a higher risk of death from heat-related conditions such as dehydration, heat stroke

Los Angeles's Rooftop Solar Potential



Los Angeles rooftops could hold an estimated 5,500 megawatts (MW) of solar panels, of which a mere fraction has been utilized. As of the end of February 2013, LADWP had installed 68 MW under the Solar Incentive Program.

Driving the Connection between Solar and Transportation

In addition to powering Los Angeles homes, businesses, schools and government buildings with clean energy, significantly increasing the city's commitment to solar power will ensure that Los Angeles is ready to transition to a future in which electric vehicles increasingly replace conventional vehicles. Fully electric vehicles, which create zero direct emissions, can play an essential role in improving Los Angeles's air quality. As electric vehicles become commonplace, it will be important to make sure that the electricity used to charge their batteries is produced by clean, renewable energy.

Recognizing the importance of integrating electric vehicles into the city's electricity grid, LADWP is expanding its charging stations, offering discounted off-peak charging rates for electric vehicle owners, and it has previously offered rebates for the first 1,000 residential electric vehicle customers to offset the cost of chargers and installation.³⁷ Incorporating more clean, local solar power into the city's energy supply will make the most of these measures and maximize Angelenos' commitment to zero emission vehicles.

and respiratory distress, among other life-threatening illnesses.³²

In addition, global warming will likely worsen Los Angeles's water supply problems. Higher temperatures will intensify the reduction of the Sierra Nevada snowpack, which accounts for over 30 percent of Los Angeles's fresh drinking water at present.³³ The Department of Water & Power is banking on this snowpack to supply over 30 percent of the city's water to 2035.³⁴ Even as fresh water is likely to become scarcer, LADWP itself has outlined that there will likely be "increased

water demands for irrigation and cooling purposes earlier in the year and for longer periods coupled with decreased local surface runoff available to recharge groundwater basins. Other impacts might include an increase in fire events impacting water quality and sedimentation, a decrease in groundwater recharge due to lower soil moisture, and sea level rise increasing seawater intrusion into coastal groundwater basins."³⁵

At the same time, Los Angeles is already experiencing the type of extreme weather events that may become even



This 116 kW solar carport system was installed at the South Region Elementary School as part of the Los Angeles Unified School District's commitment to clean energy. Credit: Los Angeles Unified School District

more common in the years ahead. In fact, Los Angeles County has been hit by 7 federally declared weather-related disasters since 2007, including wildfires, floods and mudslides.³⁶

Solar Power Saves Water

Given that water is a scarce, valuable resource in Los Angeles, it is critical to consider how power generation impacts water availability. Solar panels generate electricity without using any water beyond that needed for occasional washing. As a result, solar technology can be a smart alternative to traditional fossil fuel plants.

Traditional fossil fuel plants use vast amounts of water, constituting almost 50 percent of all water withdrawals in the country.³⁸ In California, groundwater accounts for approximately one-third to two-thirds of the water consumed by power plants, which can threaten the long-term sustainability of water supplies.³⁹

If 1,200 MW of rooftop solar displaced electricity generated from natural gas power plants, it would save an estimated 435 million gallons of water per year.⁴⁰ When every drop counts, rooftop solar power can go a long way towards saving precious water supplies and contributing to the long-term health and sustainability of the city.

The question of securing an adequate, reliable water supply for the semi-arid city of Los Angeles is as old as the city itself, long debated and well-chronicled, most famously in Marc Reisner's book *Cadillac Desert: The American West and its Disappearing Water* and in Roman Polanski's film *Chinatown*. In the decades since the city's water wars were captured in print and on film, Los Angeles has experienced multiple dry years—including its driest year on record in 2005/2006—and the Eastern

Sierra, which supplies the city with the largest share of its water, experienced the lowest snowpack on record.⁴¹ Once again this year, Los Angeles is experiencing drought conditions, on track to rank as the fourth-driest year on record, which is compounded by the Sierra snowpack measuring at only 54 percent of average this spring.⁴² Solar power can help Los Angeles stretch its limited water supplies a bit further.

Solar Power Can Create Jobs and Save Consumers Money

Solar Power Can Put Angelenos to Work

Nationwide, the solar industry is growing at a rate that eclipses most other sectors of the economy. In a year in which the overall economy increased at a rate of 2.3 percent, the U.S. solar industry in 2012 enjoyed a 13.2 percent employment growth rate over the previous year.⁴³ This translates into a cumulative total of nearly 120,000 American jobs, more than 43,000 of which are located in California.⁴⁴ Industry experts project continued rapid growth, with an anticipated 17.2 percent increase in employment over last year's figures by the end of 2013.⁴⁵

Investing in local solar power will bring greater job benefits to Los Angeles than either directing money out of state to purchase coal or building new in-basin natural gas power plants. Several studies have documented that generating electricity from renewable energy sources results in more jobs than fossil fuel based energy sources. Whereas generating 1 MW of electricity from coal and natural gas equates to .8 and .35 jobs respectively, generating this same amount of electricity from solar power provides between 11 and 35 jobs.⁴⁶ By the



Constellation Place, a high-rise building in Century City, hosts a 1 MW solar array, saving approximately 100,000 per year. Credit: Environment California Research & Policy Center

very nature of the technology, local solar energy systems require a local workforce and can be a powerful net job creator.

As Los Angeles is experiencing unemployment rates far higher than the nationwide average, the creation of new local jobs is critical to the long-term health of the city.⁴⁷ If Los Angeles achieves 1,200 MW of local solar capacity by 2020, the local employment projections are impressive. It is estimated that approximately 32,000 job-years could be created by attaining the 1,200 MW goal by the end of this decade.⁴⁸ To put this number in context, the University of California, Los Angeles—which ranks among the city’s leading employers—has a workforce of just under 32,000 people.⁴⁹

As the Los Angeles Business Council Institute has documented, Los Angeles is home to a strong solar power jobs train-

ing system, which is preparing thousands of Angelenos to take part in entry-levels trades, specialty trades, professional and technical jobs and sales and marketing positions.⁵⁰ Setting and achieving the 1,200 MW goal will enable this growing workforce to put their training to use and further develop their skills.

Solar Power Can Save Los Angeles Consumers Money

Localized solar energy technology reduces the need to build costly peaking power plants, reduces the need to upgrade expensive transmission line infrastructure, and increases the overall efficiency and resiliency of our electricity grid, all of which can save consumers significant dollars. In fact, solar power is uniquely situated to shave peak demand on electricity systems as solar energy systems generate the bulk

of their electricity at the very times when electricity demand is high. In addition, localized solar energy systems can be installed much more quickly than traditional power stations and they can be tailored to suit the needs of individual buildings, institutions or communities.

Energy is one of the biggest expenses for Los Angeles families, businesses and schools. By investing in a solar energy system, and with the right incentives in place, Los Angeles consumers can bring their energy bills down to zero, or near zero, saving money over the long run. For instance, Constellation Place, a 35-story high rise building in the Century City area of Los Angeles hosts one of the city's largest solar arrays on two parking structures, saving approximately \$100,000 per year.⁵¹ Similarly, the Los Angeles Unified School District has become a leader in solar power, installing solar projects at

dozens of school sites over the past three years. The District's goal is to expand this commitment to install solar arrays at a total of 123 schools, resulting in an average savings of up to \$800,000 each month.⁵² Both of these investments in solar energy systems were made possible, in part, thanks to rebates from the Los Angeles Department of Water & Power, demonstrating the deep impact that incentives can play in shaping the energy decisions of Los Angeles consumers, saving costs and improving the bottom line. Furthermore, with the rise in electric transportation options like electric cars, Angelenos can not only reduce their electric bills, they can also minimize the number of trips to the gas station.

By utilizing local solar power, Los Angeles can save money and generate much of the energy the city needs on or near the buildings where Angelenos live and work.



A 6.5 kW solar array offsets 90 percent of the energy needs of this building in the Mar Vista area of Los Angeles. Credit: Sarah Auerswald

Conclusion & Policy Recommendations

More than any other city in the country, Los Angeles could benefit from a robust market for rooftop solar power on homes, office buildings, schools, warehouses, parking lots, and more. Tapping Los Angeles's full potential for powering our homes and businesses with the sun could dramatically reduce our dependence on fossil fuels and our emissions of global warming pollution while also creating thousands of installation jobs that can't be outsourced.

Over the next few years, the LADWP and City Hall will make critical decisions about the sources of energy that will define the city for decades to come. The city should make a bold commitment to solar power, setting a goal of installing 1,200 megawatts of local solar power generation capacity by 2020.

Achieving this goal would secure Los Angeles's status as a clean energy leader, enable the state to meet its overall energy goals and set an influential precedent for utilities around the country.

Los Angeles Can Help California to Achieve its Overall Clean Energy Goals

Achieving the 1,200 MW goal would not only bring significant environmental and economic benefits to Los Angeles, it is critical to the state's ability to meet its clean energy goals, as outlined below.

Building a Million Solar Roofs

Historic in both scope and scale, California's Million Solar Roofs Initiative (SB 1) represented the first unified state effort to turn solar power into a commonplace and affordable energy resource. Passed in 2006, the law established a ten-year, interagency effort to fund solar projects on homes, businesses, and government and non-profit buildings throughout the state. Under SB1, LADWP's goal is to install 280 MW of rooftop solar capacity by the end of 2016. This amount represents more than nine percent of the total statewide goal.⁵² LADWP had built 68 MW by February 2013 under its Solar Incentive Program and forecasts achieving a total of 140 MW, only half of its capacity goal, by the end of the program.⁵³

SB 32 Feed-in Tariff Program

LADWP recently took a positive step towards increasing its rooftop solar commitment by establishing a city-wide feed-in-tariff program. In January 2012, the Department adopted an initial 100 MW feed-in tariff program with a commitment to expand the program to achieve 150 MW by the end of 2016.⁵⁴ This program exceeds the goals created by SB 32 (2009, Negrete McLeod), which calls for LADWP to offer a 75 MW feed-in tariff program to drive a market for solar power on commercial, industrial and multi-family housing buildings in Los Angeles.

Governor Brown's 12,000 MW Goal

While LADWP is moving in the right direction, its 2020 energy projections make clear that the utility's local solar goals are far from capitalizing on the city's solar potential. LADWP's current plan is to install merely 382 new MW of rooftop solar power, including the feed-in tariff program, by 2020.⁵⁵ This number is far short of the 1,200 MW that is LADWP's load-proportionate share of Governor Brown's goal to install 12,000 MW of local, clean power by 2020.

Moving Toward a Clean Energy Future for Los Angeles

To help build a clean energy future in Los Angeles, the Mayor, City Council and leadership at LADWP should lead the transition to a solar-powered future. Specifically, the city should set a goal of installing 1,200 megawatts of local solar power generation capacity by 2020.

Key steps to achieve this goal include, but are not limited to the following:

LADWP should fully implement and maintain the integrity of the 150 MW feed-in tariff program by 2016 and expand the program to achieve 600 MW by 2020.

- The feed-in-tariff program has the potential to drive a market for solar energy on warehouses, parking lots and other spaces where there is little on-site electricity demand and ample space to install solar panels.
- It is estimated that the 600 MW feed-in tariff program will create \$2 billion in private local investment and approximately 16,000 job-years of employment.⁵⁶

LADWP should meet and exceed the 280 MW capacity goal originally set forth for the utility under California's Million Solar Roofs Initiative (SB 1).

- The utility can achieve and exceed this goal by providing expanded rebates for Angelenos to go solar on their own homes, businesses and schools.
- This goal can also be met by expanding consumer access to net metering, which allows the customer's power meter to "spin backwards" at times when solar power production exceeds local needs. It is a simple, proven way to help make going solar affordable for consumers with on-site electricity needs, while incentivizing energy efficiency and the generation of pollution-free solar electricity during hot, smoggy summer days.

LADWP should diversify the city's solar energy consumer base.

- Policies should be designed for non-profit consumers who cannot take advantage of federal tax credits for

solar energy systems, renters or those whose roofs are not well suited for solar power, and low-income consumers.

- Such policies could include higher rebates for non-profit consumers and low-income homeowners, special programs for multifamily housing units, and community shared solar programs.

LADWP should standardize and accelerate methods for permitting and interconnection procedures.

- Minimizing challenges with permitting and interconnection, especially for residential and small commercial projects, can reduce the soft costs of installing solar, enabling more consumers to invest in solar energy systems.

LADWP should work with consumers and solar installers within LADWP territory to improve communication

and the transparency of the utility's solar programs.

- Improved transparency and communication efforts could help to strengthen the confidence of both consumers and the solar industry in LADWP's ability to efficiently implement its solar programming.

City leaders should continue to support efforts to improve the quality and expand the reach of green job training programs in Los Angeles to train the next generation of local workers to help build the city's clean energy future.

- Job training programs are a critical engine for developing the workforce needed to achieve the city's environmental goals. To ensure continued growth of Los Angeles's clean energy economy, it is critical to continue supporting efforts to improve and expand the city's green job training programs.



Residential solar photovoltaic system in Venice Beach. Credit: Mark Smith, Solar Forward

Notes

1 J.R. DeShazo and Ryan Matulka, UCLA Luskin Center for Innovation, *Bringing Solar Energy to Los Angeles*, July 2010; Assuming an average size residential solar power installation of 4 kW, installing 5,500 MW would be equivalent to installing solar energy systems on 1,375,000 homes; Los Angeles Department of Water & Power, *Power Integrated Resource Plan*, December 2012, p. 59.

2 According to Joe O'Hagan and John Maulbetsch, California Energy Commission, *Water Use for Electricity Generation*, 10 August 2009, natural gas combustion turbine plants use approximately 230 gallons of water/MWh. Assuming that 1200 MW of solar PV x 8760 hours/year x 18% capacity factor, we can assume that 1200 MW of solar PV will result in 1,892,160 MWh of solar PV per year. 230 gallons/MWh x 1,892,160 = 435,196,800 gallons of water.

3 J.R. DeShazo and Ryan Matulka, UCLA Luskin Center for Innovation, *Bringing Solar Energy to Los Angeles*, July 2010.

4 Assuming an average size residential solar power installation of 4 kW, installing 5,500 MW would be equivalent

to installing solar energy systems on 1,375,000 homes.

5 Los Angeles Department of Water & Power, *Power Integrated Resource Plan*, December 2012, A-5.

6 Assuming an average size residential solar power installation of 4 kW, installing 1,200 MW would be equivalent to installing solar energy systems on 300,000 homes.

7 The Vote Solar Initiative, *Poll: Angelenos Want More Local Solar Power. LOTS More* available at <http://votesolar.org/2012/05/la-poll/>.

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11 Los Angeles Department of Water & Power, *Power Integrated Resources Plan*, December 2012, p. 54.; Public Power, *Reinventing LADWP*, January-February 2012, p. 12-17, available at www.PublicPowerMedia.org.

12 Los Angeles Department of Water & Power, *Power Integrated Resources Plan*, December 2012, p. 54.; John Yantis, "After Setbacks, Palo Verde is Back on Track," *The Arizona Republic*, 24 November 2012.

13 Public Power, *Reinventing LADWP*, January-February 2012, p. 12-17, available at www.PublicPowerMedia.org.

14 Energy efficiency and conservation, smart city planning and development along with an aggressive shift toward renewable energy including wind, geothermal, biomass, and solar are all part of the equation for achieving a clean energy future for Los Angeles.

15 National Climatic Data Center, National Oceanic and Atmospheric Administration, *Sunshine-Average Percent (%) Possible*, 20 August 2008, available at http://www.ncdc.noaa.gov/oa/climate/online/ccd/avg_sun.html.

16 J.R. DeShazo and Ryan Matulka, UCLA Luskin Center for Innovation, *Bringing Solar Energy to Los Angeles*, July 2010; Assuming an average size residential solar power installation of 4 kW, installing 5,500 MW would be equivalent to installing solar energy systems on 1,375,000 homes.

17 Los Angeles Department of Water & Power, Solar Incentive Program Status Report, February 2013.

18 Based upon estimated solar electricity generation in Los Angeles per National Renewable Energy Laboratory, *PVWatts*

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