May 2023

Municipal Bank of LA: Clean Energy Portfolio Options

Yakov Feygin[1], Chirag Lala[3], Leila Lorenzo[1], and Patrick Robbins[2]

[1] Berggruen Institute, Los Angeles, CA
[2] Jain Family Institute, New York, NY
[3] Center for Public Enterprise, Brooklyn, NY

Acknowledgements: We would like to thank Bert Hunter, Kerry O'Neil, Johanna Bozuwa, Agustin Cabrera, Tiffany Wong, Sarah Knuth, Mitch Green, Sonaar Luthera and Andre Marcarian for their input and advice on this report.

Jain Family Institute (JFI)
jfiresearch.org
568 Broadway, Suite 601
New York, NY 10012

Berggruen Institute
www.berggruen.org
1114 6th Ave
New York, NY 10036

Contents

Introduction

Los Angeles seeks to reach carbon neutrality by 2045. To achieve this goal, the Los Angeles Department of Water and Power (LADWP) must make large scale investments into developing both new generation sources and capacity. This is a significant financing challenge that could be a major, or even exclusive, purpose of a Los Angeles Municipal Bank or Lending Fund, here referred to as the Municipal Bank of Los Angeles, or MBLA. To evaluate pathways to this goal, the city commissioned the National Renewable Energy Laboratory (NREL) to conduct scenario analysis of energy system improvements and investments needed to reach these goals, published under the title, *LA 100*.[1]

Using assumptions made in the *LA 100* report, we will examine the tradeoffs, needs and possibilities of using MBLA funds to invest in new capacity and generation to help Los Angeles achieve a carbon neutral grid by 2045. We follow the report's guidance that carbon neutrality means an energy system dominated by wind and solar generation.

Our work applies some very elementary and simplified assumptions to build several models allowing us to estimate cost reductions achieved by blending federal incentives and MBLA financing on the lifetime cost of energy generated across several renewable technologies. Our analysis is purely financial and supply side. We do not evaluate or plan specific projects but rather examine what cost savings might be reasonably obtained through MBLA's activities in this area using a set of general assumptions.

In this report, we limit ourselves to examining opportunities for community scale distributed generation and utility-scale renewables. Both are critical components to greening LA's grid by 2045. Moreover, we assume that MBLA will be working with nonprofit and public developers. The latter includes a publicly owned utility like LADWP.

As public and nonprofit entities, all three are able to take advantage of the Inflation Reduction Act's (IRAs) direct pay provisions. Direct pay allows non-profit and government entities to take advantage of tax credits for the first time. While regulatory guidance is still outstanding as of this report, we believe that Direct Pay offers far more efficient support than private tax equity markets.

The Electrical Grid and Power Generation: Some Basic Concepts

Los Angeles can convert from 65-85% of its wind and solar energy needs using resources in the Los Angeles basin. However, there are other needs which require "out-basin"

[1] Jaquelin Cochran, and Paul Denholm, eds. 2021. *The Los Angeles 100% Renewable Energy Study*. Golden, CO: National Renewable Energy Laboratory.

utility-scale investments. These out-basin sources are generally more expensive and less reliably available to Los Angeles than "in-basin" resources since they can sell their output into multiple markets.

There are several ways in which LADWP can mitigate these costs. In older models of grid management, a large utility like LADWP might have co-invested in a power plant outside of its region along with other utilities and private investors and thus have guaranteed access to the power generated.

An increasingly common way in which utilities secure access to bulk, utility-scale energy outside of their areas is through power purchasing agreements (PPAs). A PPA is simply a contract between a buyer of electrical power and a seller which guarantees a fixed price for electricity over a specified period of time. These agreements might entitle the customer to some percentage or minimum amount of the generator's output. A PPA gives a generator a guaranteed market and a utility a predictable price.

Finally, LADWP can manage supply and demand directly by incentivizing improved insulation and more energy-efficient appliances. In Los Angeles, low-energy heat pumps can take care of most residential HVAC needs. LADWP can also work to adopt smart metering programs. Smart metering can let LADWP charge customers preferred rates in exchange for installing equipment which allows the utility to decrease some power usage at high demand – for example, not allowing a customer to run their air conditioning at 55 degrees on a hot day when there is a massive need for power. As technology evolves, there are other prospects for these programs. For example, electric vehicles could, one day, turn into rolling batteries which could be set to charge their owners' residences while plugged in and not needing new power, or disconnected automatically when they are charged.

Assumptions in NREL's Study

In their study, the National Renewable Energy Laboratory examined various scenarios of demand and evolving technical systems from now until 2045 to show LADWP's options and associated costs. NREL's modeling showed that Los Angeles has unique geographic advantages because of very predictable sunshine. As such, solar in the greater Los Angeles region has a very high average "capacity factor" – in other words, the percentage of time in which it is generating electricity.

NREL also assumes several non-technological factors. First, it assumes the total phaseout of nuclear energy by 2045, despite the fact that nuclear fission produces firm, carbon-free energy. Second, it assumes current regulations for land use and real estate costs remain unchanged. Finally, it assumes that utility-scale projects will be financed in conventional markets, and it does not factor in the impacts of the Inflation Reduction Act. This is very important to keep in mind because the IRA has drastically changed the landscape of energy financing. Finally, NREL assumes new transmission is very difficult to build due to land acquisition costs, long approval processes, and legal challenges from property owners and other interested parties, including environmentalists.

Across its scenarios, NREL estimates that solar and wind can generate energy to meet between 69 and 87% of LA's electricity needs. The majority of this energy — 74 to 89% of it — will come from utility-scale, out-of-basin resources, due to their high-efficiency, low-cost output. NREL recommends heavy investments in in-basin, community and utility-owned solar on public and available land, as well as offshore floating wind. These resources allow the utility to have access to energy generated exclusively within LADWP's jurisdiction.

NREL's scenarios fluctuate depending on whether time targets are met by 2030 or 2045, or whether LA will be able to increase transmission, or use biofuels in in-basin turbines. These latter resources are critical points of tension. Transmission and biofuel-driven generators can fill the percentage of demand that solar and wind cannot. They are the "peaking" resources which can be quickly turned on when variable resources like wind and solar are not available to meet demand. In the long run, the study assumes the building of larger-scale hydrogen but acknowledges an uncertainty in that technology. As such, the city must make tradeoffs between expanding transmission to import more renewable, nuclear, geothermal, and hydro-electric sources or using biofuels to run in-basin turbines. With potential expansion of hydrogen storage, some of these choices become easier as batteries would be able to take up in-basin peaking capacities.

Solar and wind resources are very cost effective and price competitive. After their initial installation, they have virtually zero operating expenses and can generate electricity consistently, weather conditions permitting.

The Financing Environment For Renewable Energy in California

This section will discuss the major forms of renewable energy financing available nationally and in California in order to best determine where MBLA can fill financing gaps where existing state and Federal programs are insufficient.

Distributed Rooftop Solar

California has one of the country's most active programs for supporting residential solar installations, including programs for low income and multi-family buildings. The Multifamily Affordable Solar Homes Program (SMASH) funded at $162.5 million taken from ratepayer funds allows owners of low-income multifamily prosperities to receive a $1.10/W owner offset from energy generated by solar installations, with a $1.80/W tenant offset if 50% or more of the bill credits are allocated to tenant accounts. The newer Solar on Affordable Multifamily Housing (SOMAH) program funded at $100 million annually from the sale of gas allowances, expands SMASH to provide a $3.20/W offset for energy used for tenant residences and $1.10/W for common areas provided that 51% of energy is going to use by the building's low-income residents. The equivalent single family low-income program is the California Disadvantaged Communities Single Family Solar Homes Program (DAC-SASH),which subsidizes the installation of solar panels for low-income single-family homes at $3,000 per installed kW, up to a maximum of 5.0 kW.

The California Low-Income Weatherization Program for Multifamily Properties (LIWP-MF) serves a similar role to SMASH and SOMAH to incentivize building and single-family homeowners to upgrade weatherization to reduce energy usage. Funded from the state's cap-and-trade program at $252 million through the 2023 financial year, LIWP-MF supports the weatherization of low-income residences by paying for efficiency retrofit planning from the American Clean Energy Association. The program awards $3,000 for each metric ton of CO2 reduced by energy-efficiency measures that affect the building's owner-paid energy, and $4,500 for each metric ton of CO2 reduced by efficiency measures tied to renter paid-energy, based on the administrator's pre-project assessment of savings.

In addition to programs for disadvantaged and low-income communities, California has several other relevant programs. A property assessed clean energy (PACE) program reduces rates to homeowners under the moniker, California First. The state also offers the Self-Generation Incentive Program (SGIP), to incentivize the installation of residential storage at $200 per kWh of battery installed. Finally, the state has enabled net metering, which allows homeowners to "sell" excess energy into the grid. LADWP offers PPA agreements with homeowners that payout rates for excess generation against a power bill. It also offers lease programs to buy roof space from homeowners and building owners.[2]

Federal programs offer a 30% production tax credit for home solar installation. Under the IRA's Greenhouse Gas House Reduction Fund (GGRF), the EPA will be awarding $27 billion to state green banks, non-profits and CDFIs to help invest in weatherization and renewable energy in low-income and disadvantaged communities. While this funding will likely go to a state-level entity, MBLA could potentially take advantage of it, as well.[3]

---

[2] "Issue Brief: Reducing Energy Burden for Low-Income Residents in Multifamily Housing with Solar Energy," Better Buildings Initiative, US DOE, 2019; Stefen Samarripas and Dan York, "Our Powers Combined: Energy Efficiency and Solar in Affordable Multifamily Buildings, American Council for an Energy-Efficient Economy, no. U1804, May 2018. Program specific data as of 2021.
[3] EPA Announces Initial Program Design for Green House Fund Reduction Fund, *EPA Information Service*, February 12, 2023, https://www.epa.gov/newsreleases/epa-announces-initial-program-design-greenhouse-gas-reduction-fund

As such, the key challenge is not the availability of small-scale project finance but rather the vetting of lenders and contractors. For this reason, the California state government has outsourced some of this vetting to non-profit service organizations such as Grid Alternatives and the American Clean Power Alliance.

Community Solar

Community-scale generation is typically a solar energy project in the form of a 1-5 mw solar farm and is available to community members by subscription. Thus, community-scale solar projects allow individuals and households to purchase solar energy from a local generation project without having to install solar panels on their roofs. Instead, the customer signs up for a power purchase agreement for a certain amount of kw/hs of energy from the solar farm.

Typically, these prices are below that of wholesale energy offered by the utility. Like rooftop consumers, community solar members receive credit against their bill for energy sold by the solar farm to the electrical grid as a whole. Community solar projects can be sponsored by a utility company, a community group which forms an LLC, or a non-profit organization.[4]

The most common of these are utility-sponsored community solar projects. For this reason, it is often hard to distinguish between a small-scale utility solar project and a community solar project from the point of view of technology and project financing. For the purpose of this report, we will assume community solar to be closer in technical features to distributed solar.

Community solar offers many advantages over rooftop solar. First, it is more accessible to individuals who do not have rooftops of their own or whose roofs are not able to support solar panels. This often means that they are more accessible to low income households and renters. Second, community solar is planned at scale to integrate with the electricity grid. As such, it avoids the pitfalls of rooftop solar which can often overproduce energy for the grid at peak production while requiring energy from other sources without either planning processes or paying for improvements and other sources of energy. In essence, a community solar project acts as a miniature utility-scale plant that one can buy a subscription to. Finally, community solar is one of the best options for generating electricity in the LA basin and can be sited on public land including schools and parking structures.

California has been a laggard in community solar development due to inadequate regulation and enabling laws. However, AB 2316, passed in September 2022, has initiated an overhaul of California's regulation of community solar. Under AB 2316, the state has created a regulatory framework for utilities to be able to rapidly initiate community solar

[4] "Community Solar Basics," https://www.energy.gov/eere/solar/community-solar-basics

projects if they meet certain criteria like having 51% of their subscribers be low-income households, allowing them to receive the largest apportionment of IRA tax credits, extending low-income solar subsidy programs to community solar subscribers, and creating a rate regime where prices reflect the cost of power to the total electrical grid.[5]

Utility-Scale Financing

The primary form of financing for utility-scale construction is through federal tax credits. The Federal Government provides Investment Tax Credits (ITC) and Production Tax Credits (PTC) for wind and solar developers. Developers can use these credits to gain discounts on their tax bills. However, in practice, tax credits are used to lower the cost of financing through so-called “tax equity” financing. A private developer might not have a significant tax bill to apply credits against. However, they can enter a deal with an institution – usually a large bank – which does have a large tax bill or can sell credits to others with such bills to transfer credits via a joint-financing structure.

Though these structures can take a variety of forms, they mostly involve an outside investor financing equity in a new project in exchange for a certain amount of the tax credits. This is done through a special financing vehicle (SPV) which gives the equity investor some majority percent ownership over a portion of the project with limited control giving it access to credits. Once a certain number of credits has been generated, the investor transfers the equity to the developer and leaves the project. As such, the federal tax incentives create a financing program for wind and solar developers working at scale.

Under the Inflation Reduction Act (IRA), ITC and PTC have been extended to other carbon-neutral technologies such as geothermal, nuclear, battery storage, and hydrogen. Extending the tax credit from exclusively variable resources such as solar and wind allows for “firm resources” – generation which is not dependent on weather – to compete on a more level playing field with variable renewables. This is crucial because even in the best-case scenario, such resources will be needed to fill the gap when solar and wind are not available to meet consumer demand. Without these subsidies, the expansion of solar and wind energy in California has been accompanied by increased demand for natural gas as a “peaker” which can quickly and cheaply come online during hours of high demand and low renewable availability.

[5] Steve Hanely, “California Embraces a New Approach to Community Solar” *Clean Technica*, September 11, 2022. https://cleantechnica.com/2022/09/11/california-embraces-a-new-approach-to-community-solar/

RECs and PPAs in the Context of Energy Project Finance

California offers generous incentives for the development of wind and solar at utility-scale. Most of these are structured around Renewable Energy Certificates (REC). Utilities are subject to laws requiring them to use certain amounts of clean energy. To achieve this, they must either produce or buy clean energy directly, thereby generating RECs, or they have to buy RECs from clean energy suppliers on the open market to offset the non-clean energy that they used. As such, REC sales offer a project-financing base for utility-scale wind and solar.

Renewable energy and carbon-free alternatives are often structured via a power purchasing agreement (PPA). As noted above, a PPA is a long term contract guaranteeing a consumer a certain price from energy generated by a specific power source, while offering the developer/operator a guaranteed market. PPA energy prices are generally below prices on the spot market – the market for uncontracted, available electricity. Signing PPAs gives developers assurances of future cash flows and thus eases financing. PPAs can be signed at household, community, and utility scale.

The Promise of "Direct Pay"

The ITC and PTC programs have been the leading drivers of the solar and wind industries. However, because they were designed as tax credits discounted against a project's taxes, they could not easily be captured by a public or non-profit entity which does not pay federal taxes. Thus solar and wind energy has been dominated by private developers. Public utility ownership of renewable energy is uncommon relative to gas, coal, and other carbon-intensive power sources.

The IRA is bringing drastic changes to this system by allowing for municipal, state, and nonprofit entities to take ITC and PTC credits as "direct pay." Direct pay means that instead of discounting credits against a non-existing tax bill, or even having to engineer a deal with a tax equity investor, eligible public and nonprofit entities will be able to claim their tax credits as a cash payment from the IRS. In other words, direct pay is almost like a Federal grant. Under IRA, a project meeting domestic-content, labor, and disadvantaged-community-access standards can have as much as 50% of its cost – the typical share of equity in a renewable energy utility and community-scale project – covered by direct pay tax credits.

Direct pay is a game changer but does not replace the need for a public lender like MBLA. First, as of May 2023, there are still many regulatory questions regarding the functioning of the direct pay program which are being resolved in federal rulemaking. Direct pay programs will likely need at least some bridge financing if payments from the IRS are dispersed over a multiyear horizon. Second, tax credits can cover, at most, fifty percent of the project's financing needs. The rest of the project must be financed either through additional equity or debt. Though we do not yet know the exact parameters of federal rulemaking, it is very likely that the IRS will impose a 10% penalty on any project that is also financed by municipal, tax exempt bonds to avoid "double dipping" – in other words, using two tax exemptions for the same project.

Under these circumstances, a public bank is a vital accelerator for the direct pay credit regime. First, MBLA could offer general, below-market-rate terms of financing to cover the remaining financing needs of a project. Second, the bank could offer bridge financing to cover the period between the approval of tax credit financing and the issuance of direct payments from the IRS. Finally, MBLA could raise capital on the municipal bond market and offer loans to public entities, thereby likely avoiding the 10% haircut on federal payments.

Future Prospects: Transmission

A final critical component of understanding utility-scale power is the transmission system. Because most utility-scale generation is out-basin, Los Angeles must bring this power into the LADWP's grid. Compared to many similar American municipalities, Los Angeles has a very extensive and new transmission system. However, expanding this system is difficult. First, California's land use and environmental regulations make securing the right of way for large, commercial scale power lines extremely time consuming and at times uncertain. This raises financing costs significantly.Second, interconnection, or hooking a new resource to existing transmission lines, can be very expensive. Due to these uncertainties developers will often wait to secure a PPA from a customer before putting up capital to do grid improvements which allow them to connect their resources to a particular area. On the other hand, without that connection in place, PPA funding terms are very uncertain.

There are several Federal and State programs which are starting to try and address this obvious market failure. First, the Department of Energy has expanded the Grid Modernization Program's grant facility to $2.5 billion and the department's grid financing programs have been expanded to $13.5 billion.[6] In California, the State Infrastructure and Economic Development Bank (IBank) has launched a Green Banking division called the Catalyst Fund. The Ibank is beginning pilot projects to provide low-rate financing for new, utility-scale transmission running out of the Salton Sea region to connect new geothermal developers to customers across Southern California. This project is being run with a private developer – Berkshire Hathaway – and represents the first time a public green bank has worked on a large, utility-scale transmission project.[7]

[6] Ashley J. Lawson, "Electricity Provisions in the Inflation Reduction Act of 2022" Congressional Research Service no. IN11981, August 23, 2022.
[7] Sam Uden and Amanda DeMarco, "California Advances toward Climate Goals: The $39 Billion Budget," *CSG Blog* (blog), September 27, 2022,

However, we are in regulatory infancy regarding the use of public credit and lending for transmission. Federal guidance is still being worked out regarding the ability of regulators to designate projects which can be eligible for support. Moreover, there are legal uncertainties regarding permitting and interstate connections that affect the LA basin. As such, we will not be explicitly modeling MBLA's potential impact on transmission but wish to flag it as an area of future interest.

MBLA's Role in the Southern California Energy Transition

Focusing on Utility- and Community-Scale Power

Under the assumptions of NREL's *LA 100* Study, LA will be able to use rooftop solar but will still derive the bulk of its electrical power from in- and out-basin utility-scale power. Utility-scale power is far harder to finance than rooftop or community solar. Moreover, there are not as many state or municipal financing programs available to these projects. There are several reasons for this. First, these are usually for-profit enterprises built by large developers. Outside of Federal tax credits, many governments do not see the need to support these projects that will be very profitable. Second, due to the importance of tax credits in financing clean energy investment, government agencies, power cooperatives, and public utilities are not very active in renewable development.

Analysis from Lazard confirms our suspicions that utility-scale projects are far more rate- and subsidy-sensitive than small scale community and rooftop programs. The economics behind this are relatively intuitive. Large fixed-capital investments carry greater uncertainty than small investments. Moreover, the default risk in a utility-scale project is concentrated in one borrower, compared to a broader portfolio of smaller borrowers. A default by one borrower in a diversified portfolio, as long as the borrowers are uncorrelated, does not harm the overall vehicle. On the other hand, a utility borrower's default will trigger a complex bankruptcy. Thus, expanding public support for larger-scale projects will have a larger effect on the ecosystem, and they are critical in achieving Los Angeles' decarbonization goals.[8]

LADWP has already been active in this area. It is the operator of several clean energy assets including the country's largest municipally owned renewable energy project, the

https://www.csgcalifornia.com/blog/stocktaking-californias-historic-climate-and-clean-energy-legislative-session-part-1-of-3/.

[8] "Lazard Levelized Cost of Energy Analysis, Version 18.0," Lazard Asset Management, 2023 https://www.lazard.com/media/451086/lazards-levelized-cost-of-energy-version-130-vf.pdf

Pine Tree Wind Farm, funded by a combination of municipal bond finance and federal funding under the 2009 American Recovery and Reinvestment Act.

With the IRA's direct pay provisions coming into effect in the next year, the public role in renewable development will likely grow.[9] As discussed above, California already has extensive rooftop penetration and active financing programs. Small lenders and CDFIs are not active in larger scale renewable lending, which means that MBLA would not only be filling a financing gap but would likely avoid conflict with AB 857's non-competition provision.

Evaluation Approach

To capture the impact of MBLA on the Los Angeles energy transition, we must take into account two sides of a problem. First, is the project finance side. This means finding out how much savings MBLA can bring to the cost of energy produced by a representative energy project from the point of view of the finances of that specific development. Second is the portfolio impact side, which looks at investments and returns, including MWhrs/$ (megawatt hours per dollar) generated by the bank's potential investments overall. This section explains our methods for both sides of the coin.

Our work is done through "scenarios" of project financing and energy demand. In the uncertain financial, technological, and policy environment we are facing, it is very difficult to guarantee specific representative projects. This is especially difficult since energy-generation projects, in practice, are extremely heterogeneous. Finally, we assume that borrowing organizations have the capacity to maximize their tax benefits and use MBLA financing effectively.

Energy projects, like other capital investments, have different tranches of financing. These are broken into equity and debt portions. Equity holders are owners of the project and retain ownership rights until they sell their stakes. Debt holders are not owners but receive a portion of the project's cash flows as debt payments. Debt financing is less risky than equity financing because, in the process of bankruptcy, debt holders are made whole before equity holders. In other words, debt holders will receive whatever residuals that the project has up to the amount that makes them whole. Equity holders will split the remainder.

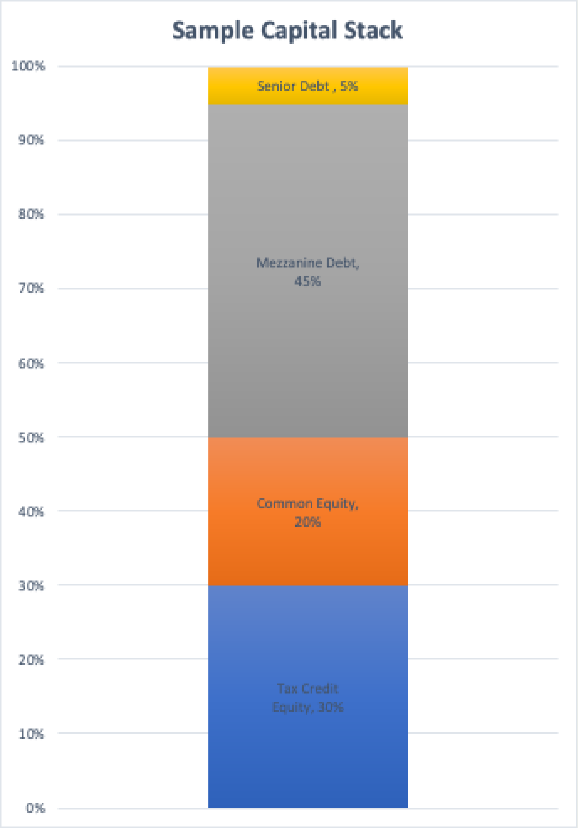
Within both debt and equity, there are subcategories. So-called "mezzanine debt" is debt with lower priority in the bankruptcy process than other shares of debt. One critical function of public banking is to provide such mezzanine debt, which offers a first-loss protection on other, market-rate debt. This makes market-rate debt less risky and

[9] "LADWP Completes Second Utility-Built Solar Array Pine Tree Solar Project Brings 8.5 MW Sun Power to L.A." LADWP Press Report , March 22, 2013; https://www.ladwpnews.com/ladwp-completes-second-utility-built-solar-array-pine-tree-solar-project-brings-8-5-mw-sun-power-to-l-a/

therefore cheaper. Equity can also have different values which come from voting rights and priority in bankruptcy.

In project finance documents, these shares are arranged in a "capital stack" diagram, which represents the portions of financing as percentages with equity, the riskiest form of financing, at the top and debt, the least risky, at the bottom.

Figure 1: Example Capital Stack



This example capital stack shows senior debt on top (5%), followed by mezzanine debt (45%), then common equity (20%), and finally tax credit equity (30%) at the base.

The financing cost of a project is the weighted average cost of capital (WACC) – the cost of each source of capital multiplied by its weight in the capital stack, as represented in the following formula:

$$WACC = (E/(E + D) * rE + D)/((E + D) * rD))(1 - T)$$

Where:

E = Equity of project in $
D = Debt of project in $

rE = Cost of equity in %
rD = Cost of Debt (interest rate on loans)
T = Tax rate

Because our sample projects are public or non-profit, we will assume a 0% tax rate.

In evaluating the impact of MBLA lending, the WACC allows us to view impacts from the point of view of the project, which includes other forms of financing. In our analysis, we use two model capital stacks. Both projects would be built by either a public utility – LADWP – or non-profit developer, allowing them to take full advantage of Federal direct pay. We then used these figures to compare the impact of MBLA vs. market-rate financing on the cost of energy over the lifetime and viability of the project .

Our measure of cost of energy is the levelized cost of energy (LCOE). The LCOE is an estimate of the net present value of the cost of energy over the lifetime of the new generation project per MW/h. In other words, it is a way of representing how expenses over the lifetime of the project influence the cost of generation over the same period, expressed in terms of the current price. The LCOE is extremely useful for comparing the efficiencies of different generation technologies.

Lowering LCOE can result in bill savings. Under utility regulation, a reduced cost of capital should lower costs to consumers. However, this is very difficult to model given an uncertain regulatory environment, and our report will not make explicit claims to savings.

LCOE is computed using the following formula:

LCOE = NPV of Lifetime Costs/NPV of Lifetime Energy Generation

Or

$$LCOE = \sum_{t}^{n} [(It + Mt + Ft)/ (1 + r)^{t}]/ \sum_{t}^{n}[Et/(1 + r)^{t}]$$

Where:

I = Cost of investment
M = Operations and maintenance
F = Fuel costs
E = Energy generated over lifetime
r = Cost of capital (WACC)
t= Period of operation

We used estimates from the 2023 Energy Information Agency (EIA) 2023 Energy Outlook to calculate a representative system's upfront investment and maintenance and operations costs. The first is calculated using a metric called the overnight cost of capital (OCC), which collapses all upfront investment into one number as if the new project were built "overnight." The second is an operations and maintenance metric (fixed O&M). We calculated the net present value of each under our WACC scenarios and applied EIA estimates for generation output, capacity, and construction times as engineering variables.

While LCOE is useful for comparing technologies and savings, it has serious limitations. The electrical grid is a complex system that some have likened to a single machine, wherein different elements are constituent parts. As such, the value of a single project or technology is affected by its impact on other generations. For example, variable sources like wind and solar have relatively low LCOEs but do not always generate electricity. Thus, to meet demand and balance the grid, more expensive resources need to be built to supplement them. Costs to the system as a whole might be higher than those represented by individual project LCOEs.

Alternative measures such as the Levelized Avoided Cost or Energy (LACE) and Value Added Levelized Cost of Energy (VLCOE) have been proposed to solve this problem. However, such measures require grid-scale data, which this team does not currently have access to. Instead, we take a relatively less rigorous approach and allow NREL scenario plans to guide our evaluation of LCOEs.

Finally, we attempt to examine the potential profitability of the project at different rates to see whether MBLA financing can not only reduce costs but make unprofitable projects financially viable.

Our valuation of lending impact is based on the outputs from the project finance models described above. Using our computed LCOEs, we can make some baseline assumptions about the life MW/hrs that a given sum of MBLA investment can generate if it were to be fully used by eligible developers to build new generation capacity. This is a purely supply -side calculation. Actual loan uptake is very hard to predict and, because electrical grids are complex interdependent systems, actual projects have to be planned for resiliency rather than low costs alone.

As such, while we will present some uncapped MWhs that a loan book could potentially generate, the real output from MBLA lending cannot be directly estimated via our methods. Instead, we can only show the reduced LCOE that results from MBLA financing and make assumptions from there.

We also can then compute some very simple returns from the projects. Again, these assume that the lending portfolio is fully re-invested into similar uses rather than shifted as demand for funds changes. Such complex energy scenario modeling is beyond the scope of this report.

Future research and work by the city and its agencies can be useful in determining how to dynamically adjust portfolio allocation to enable a comprehensive transition plan.

Community-Scale Solar Development

Community-scale solar is still a relatively small share of American solar installation and capital markets for it are underdeveloped. Thus, extensive data on private-sector lending and default rates is not available. In 2022, DSD Partners, a solar developer, launched the first capital market product with significant community solar participation with Credit Suisse. The Osprey I Asset-Backed Security (ABS) is effectively a $155 million bundle of loans from Credit Suisse which is sold to investors as a note. The note's senior shares have a rate of 5.3% equivalent to a AA rating. We discount our risk rating one grade to come to an estimated lending rate for MBLA of 4.6 corresponding to a slightly higher grade of credit. Assuming standard costs of equity and maximum tax credit, the project's WACCs are 2.7% and 2.3% respectively.

Using the procedures above, we were able to compute two forms of LCOE for community scale solar projects. Due to policy uncertainty, we compute two sets of LCOEs; one assumes a tax credit paid out as a lump sum and one that amortizes the credit over the project lifetime of 30 years. We believe that the most likely case is that tax credits will be amortized over an extended period.

Table 1: Hypothetical Community-Scale Solar Savings under Both Amortization Scenarios

Subsidized LCOE (2022$/MWh)	Lump-Sum Direct Pay	Amortized Direct Pay
Market Financing	$27.20	$31.89
MBLA Financing	$26.24	$30.23

We apply a range of PPA prices from data taken from the Bloomberg Terminal and other sources between $29 and $45 per megawatt hour. This reflects that CA pricing is not just a function of costs to the project but also of avoided costs to the grid. We simulate additional revenues from RECs and other spot sales via a standard REC adder from Southern California Edison. As a result, both market-financed and MBLA-financed community solar projects can clear a "hurdle rate" – the minimum return required – determined based on the equivalent risk-free US Treasury plus interest, making them financially viable.

The performance of the bank portfolio is subject to factors that are exogenous to our model, for example, initial appropriations and borrowing rates. (Readers can simulate the impact of choosing different values for these factors in the balance sheet simulator to accompany this series of reports.) However, to illustrate one case, a $50 million loan program, if fully utilized by developers with all available tax credits, could potentially generate 1,653,986 MWh over 30 years under an assumption of amortized tax credits.

Moreover, electrical systems require planning. Oversaturation of one generation source reduces the reliability of electricity provision to customers and is potentially dangerous. Community solar is also an ill-defined category of energy generation. For some advocates, community solar is a project defined by its relationship to the community it serves, in so far as it is localized in its distribution and is funded by community members' PPAs.

In practice, community solar will require the intervention of a utility to authorize and, in the context of Los Angeles, the vast majority of LADWP "in basin" solar investment might be understood to be community solar in scale. NREL's study does not have a separate category for community solar, though in-basin, non-rooftop generation is the closest analog. NREL's conclusion is that Los Angeles has the potential to house 5,666 MWs of solar generation and 1,599 MWs of associated battery storage. Most of these sources have a modified LCOE of $100 MWh/$ but have not associated cost reductions from tax credits and public banking. Given these factors, the maximum demand for loans is limited by technical factors and loan to LCOE ratios do not represent the real generation that MBLA will stimulate. However, the reduced LCOEs created by MBLA loans represent a significant saving on the part of each project and thus, to consumers.

MBLA's community solar programs may have many non-financial tangible benefits. As we noted, community solar financing is currently in its infancy compared to rooftop and other distributed solar projects. Enabling more community solar can stimulate the creation of a deeper market for loans to community projects both in LA and across the country. Such markets would enable more entities such as community groups and nonprofits in regions without a public utility like Los Angeles to take the lead on building community-focused solar projects.

Utility-Scale Debt Financing for Renewable Energy

Utility-scale financing requires much larger loan outputs due to project size. In turn, these projects can generate more electricity and can serve much larger areas than community-scale projects.

Utility-scale projects can take advantage of a wider number of technologies. In our case, we have decided to limit ourselves to three technologies: on-shore wind, off-shore wind, and utility-scale solar. These are not the only technologies MBLA might choose to fund. With a wider scope and mission, we could imagine MBLA also beginning to enter advanced nuclear, geothermal, and hydrogen power. These technologies are still somewhat uncertain and may take larger, more risky loans than those which could be offered by a city-scale bank. We have also chosen not to model a pure solar and tracking system because we are not sure it would provide much more information than a solar and battery project.

Using publicly available data, we assign a uniform 4.2% cost of market-rate debt and a 13.9% cost of equity to all three technologies. We set MBLA's lending rate to 3.5% using the discount rate for AA- debt. Assuming full federal tax credits, our WACCs are 2.1% for market-financed projects and 1.8% for MBLA-financed projects. We then compute LCOEs based on representative engineering variables from the EIA.

Our results across the technologies are shown below. As with community solar, we present LCOEs under both lump-sum and amortized direct pay scenarios:

Table 2: Hypothetical Utility-Scale Solar Savings under Both Amortization Scenarios

Subsidized LCOE (2022$/MWh)	Lump-Sum Direct Pay	Amortized Direct Pay
Market Financing	$19.75	$22.51
MBLA FInancing	$19.14	$21.43

Table 3: Hypothetical Utility-Scale Onshore Wind Savings under Both Amortization Scenarios

Subsidized LCOE (2022$/MWh)	Lump-Sum Direct Pay	Amortized Direct Pay
Market Financing	$20.58	$21.92
MBLA Financing	$19.98	$21.01

Table 4: Hypothetical Utility-Scale Offshore Wind Savings under Both Amortization Scenarios

Subsidized LCOE (2022$/MWh)	Lump-Sum Direct Pay	Amortized Direct Pay
Market Financing	$65.27	$68.68
MBLA Financing	$63.75	$66.38

For each technology, we simulate returns based on prospective PPA prices and REC adders. We find that under each scenario, all projects are financially viable when compared to our hurdle rate.

To present a portfolio of loans, we apply weights based on the needs of a potential financing plan to meet 2045 goals under *LA 100* based on a mix of energy that is installed by 2035 . Restricting ourselves to the three tested technologies, we assign portfolio weights of 70% for utility-scale solar, 20% for onshore wind, and 10% for offshore wind. Considering the higher entry cost of utility-scale programs, we model a $100,000,000 loan portfolio, resulting in 4,043,628 MW/hrs over 30 years.

As with community solar, there are other constraints like supply availability and energy demand, as well as minimum viable entry for projects, in other words, the minimum size of the loan, which are project-specific. Using NREL's definitions of utility scale and its intersection with what might in other contexts be understood as community scale, we apply our definition to projects which are above 5 MWs of generation capacity. NREL also argues that a large portion of this might have to be out-basin, due to the costs of in-basin energy. In LADWP's 2022 strategic plan, the utility is planning on building 3,463 MW of new large-scale in- and out-basin renewable power. Thus, as with community power, the maximum demand for loans is limited by technical factors, and loan-to-LCOE ratios do not represent the real generation that MBLA will stimulate.

However, we find that on a per-project basis, we get extremely significant savings in LCOE. This is especially true for wind projects which are much more capital intensive than solar technologies but tend to provide very consistent power output. Moreover, recent data indicates that PPA rates on utility scale projects – especially wind projects – are increasing due to rising material costs and interest rates. Under these conditions, reductions in LCOEs for utility scale projects will have a larger impact on prices to consumers than we may expect. Under our definition of a hurdle rate, private developers and lenders will have to charge significantly more to energy consumers to attract capital.[10]

Residential and Commercial Solar and Retrofit Programs

MBLA may choose to engage in a variety of lending programs targeted at residential and commercial solar customers. These programs might have some impact on uptake in California. Based on the experience of the Connecticut Green Bank, state-supported banking is successful at both raising tax equity financing and at providing bridge financing. Most importantly, the public green bank has been successful as a catalyst by gaining and transmitting experience between contractors and customers.

However, it is important to note that California's equivalent programs already strongly promote rooftop solar by national standards, even in disadvantaged and low-income communities. The Connecticut Green Bank's success is often compared to California's as two different strategies for mobilizing green capital. In Connecticut, the Green Bank uses revenues from state energy tariffs to capitalize its lending programs and create low-cost products, while California moves that same funding to the property owners directly and allows them to use the payouts from subsidies to secure low rates from private funders. In effect, these are very similar.[11]

Given the state's high saturation of programs and incentives, we have not modeled these potential portfolios due to data and resource constraints. However, in the closing section of this report, we provide examples of three programs which could be undertaken by MBLA in this market.

---

[10] Ros Davidson, "North American PPA prices rise in first quarter as IRA stabilizes market" *Wind Power Monthly*, April 20, 2023 https://www.windpowermonthly.com/article/1820272/north-american-ppa-prices-rise-first-quarter-ira-stabilises-market

[11] Stephen Sammparias and Dan York, "Our Powers Combined: Energy Efficiency and Solar in Multifamily Buildings" American Council for an Energy-Efficient Economy Working Paper no. U1804, May 2018.

Solar PPA Bridge Loans

Rooftop Power Purchasing Agreements (PPAs) are a form of lease agreement that allows a property owner to lease out their rooftop or other eligible property for the installation of solar equipment. The owner can then purchase energy from the lessor or allow the lessor to sell energy into the grid for a dividend or a discount off their energy bill. Thus, the owner can then benefit from reductions to energy prices provided by the solar equipment without taking on the risk of having to install and maintain it themselves. Typically, a PPA has an agreement that allows the owner of the property to purchase installed equipment at the end of the lease period for a predetermined price.

Like other leases, PPAs are limited by the credit of the leasee. MBLA could lower the credit risk to contractors by creating a fund for PPA loans to qualified PPA contractors willing to work with low-income communities. The loan could leverage two forms of financing. First, the bank could issue loss protection tier debt into the PPA fund's debt structure, thereby attracting other lenders. In other words, MBLA could allow other creditors to take payments before it would receive its own.

Second, the bank could invest equity into the structure relying on tax credits and solar renewable energy certificates (SRECs) as an incentive to crowd in private investors. Under this scheme, the bank would create a financing vehicle partly owned by tax-equity investors who can transfer tax credits to their own tax liabilities. The vehicle would also take proceeds from payments made to owners under SREC schemes which are purchased by utilities and firms to meet regulatory requirements for clean-energy generation and usage.

A public bank could be uniquely suited to operate such a scheme because it would not only integrate private and public financing but would also exercise quality control. For example, like previous green bank schemes, the PPA fund could use alternative metrics developed by firms such as Inclusive Prosperity Capital (IPC) to allow property owners with low FICO scores to qualify for PPA agreements. Moreover, successful public banks create an infrastructure for other mission lenders like CDFIs to participate in these programs and build ties with contractors and residents in the community. The key backend to this program would be public outreach as well as contractor training and prequalification for accessing PPA lease loans.

Blending Efficiency Retrofits & PPAs in Low-Income Multifamily Developments

One barrier to financing energy-efficiency retrofits for residential buildings is that there is no explicit cash flow from a retrofit. Energy retrofits are especially important for low-income multifamily housing. Residents of this sector of the housing market spend as much as three times the share of their income on energy as similar households in higher income brackets.

Under a combined efficiency and solar program, building owners could take out an unsecured loan from a financing structure that is analogous to a pure PPA loan. An MBLA-approved contractor would make an assessment on potential energy savings from retrofits and combine them with the cash flow from the PPA. The savings on the energy bill would be used to pay off the low-interest loan through "on-bill" financing – in other words, the loan would be paid off via the difference between savings and energy costs ex-savings on the utility bill. Adding together retrofits and solar PPAs would secure cash streams from both and thus would make loan burdens lower than a PPA or retrofit on its own.

CPACE Secured Loan Programs for Commercial Customers

Commercial Property Assessment Clean Energy (CPACE) programs work very similarly to retrofit programs that are repaid through on-bill payments. However, in CPACE financing, the loan is secured against a specific commercial property's increased value due to an improvement. Under CPACE, a building owner applies for a CPACE assessment. Upon approval, a loan is issued by a lender authorized by a municipality to issue CPACE loans. The loan is then paid back via the property tax bill.

CPACE programs differ from residentially focused PACE programs in so far as they tend to have fewer known disparities and target a less vulnerable population. However, there are still many pitfalls to CPACE programs such as unscrupulous contractors and lack of access by small and minority owned businesses. Often these problems are linked to administrative issues linked to private sector PACE lenders. Green banks have shown themselves to be effective CPACE lenders and have expanded the eligibility for CPACE loans to more clients by using alternative credit metrics.

Conclusion

Los Angeles and California are already leaders in America's climate transition. However, there is still much work to be done to turn LA's power grid into a carbon-neutral, reliable system. Turning LA's energy consumption green will be much easier under the programs incentivized by the IRA. In fact, LA has the opportunity to pursue a particularly progressive, public system of energy provision owing to the fact that LADWP is a unique entity: it is a utility, a balancing authority, and a power generator all in one.

Our findings indicate that MBLA can be a key player in this new ecosystem of clean, public power. By providing low cost, not-for-profit capital to LADWP and its community partners, MBLA will significantly reduce the cost of the city's energy. It will also guarantee the continuing viability of new energy projects in the context of an increasingly uncertain and complex energy financing and pricing landscape.