Energy Research and Development Division

FINAL PROJECT REPORT

Groundwork San Diego: The Chollas EcoVillage Project

California Energy Commission

Edmund G. Brown Jr., Governor

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PREFACE

The California Energy Commission's Energy Research and Development Division supports energy research and development programs to spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution and transportation.

In 2012, the Electric Program Investment Charge (EPIC) was established by the California Public Utilities Commission to fund public investments in research to create and advance new energy solution, foster regional innovation and bring ideas from the lab to the marketplace. The California Energy Commission and the state's three largest investor-owned utilities – Pacific Gas and Electric Company, San Diego Gas & Electric Company and Southern California Edison Company – were selected to administer the EPIC funds and advance novel technologies, tools, and strategies that provide benefits to their electric ratepayers.

The Energy Commission is committed to ensuring public participation in its research and development programs that promote greater reliability, lower costs, and increase safety for the California electric ratepayer and include:

- Providing societal benefits.
- Reducing greenhouse gas emission in the electricity sector at the lowest possible cost.
- Supporting California's loading order to meet energy needs first with energy efficiency and demand response, next with renewable energy (distributed generation and utility scale), and finally with clean, conventional electricity supply.
- Supporting low-emission vehicles and transportation.
- Providing economic development.
- Using ratepayer funds efficiently.

Groundwork San Diego: The Chollas EcoVillage Project is the final report for The Chollas EcoVillage Project (Contract Number EPC-15-066) conducted by Groundwork San Diego. The information from this project contributes to Energy Research and Development Division's EPIC Program.

For more information about the Energy Research and Development Division, please visit the Energy Commission's website at www.energy.ca.gov/research/ or contact the Energy Commission at 916-327-1551.

ABSTRACT

Innovations in energy require innovations in community interaction. This master planning project creates the framework for both, showing how to change the paradigm of the community from a limited role of consumer to an expanded role of creator, partner, leader, and owner. This transformation is essential in disadvantaged communities, as they are disproportionally affected by climate change.

Groundwork San Diego-Chollas Creek, a community-based organization, demonstrated pathways to create the Chollas EcoVillage, an advanced energy community located in the disadvantaged community of Encanto in San Diego. A unique partnership was forged between Groundwork, San Diego Unified School District and the University of California San Diego to develop a master plan to begin the build-out of the advanced energy community with an ultimate goal of near zero net energy (nZNE). This plan designed a connected system of distributed energy resources (DERs) to include photovoltaics, storage, and microgrid technologies. A portion of the generated energy will be regulated by a new California Community Solar Tariff; all energy generation and storage will contribute to improved energy safety, reliability and lower costs for the for energy for the community. Through extensive community survey and engagement efforts, the community expresses readiness to transition to an Advanced Energy Community.

Keywords: Advanced Energy Community, Community Based Organization, Community Solar Program, Distributed Energy Resource, Green Tariff Share Renewable

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EXECUTIVE SUMMARY

Introduction

California is a leader in advancing clean energy research demonstration projects that support the state's energy policy goals by promoting greater electricity reliability, lower costs, and increasing safety. To achieve these goals, California state agencies, local governments, and technology partners are collaborating and funding innovative solutions, helping communities transition to an efficient low-carbon economy using electricity generated from clean, renewable resources. Advanced energy communities are a creative solution local governments and partners are pursuing technologies and strategies to improve electrical grid reliability and resiliency and increase energy efficiency, renewable energy, smart grid, and zero net energy technologies.

The Groundwork San Diego-Chollas Creek team developed an innovative and replicable approach for accelerating an advanced energy community (AEC) in Encanto, a San Diego, California low-income and disadvantaged community to improve the electric grid reliability and resiliency rather than constructing new transmission and distribution lines and systems. Disadvantage communities are areas designated by the California Environmental Protection Agency in the state that are most burdened by pollution from multiple sources and most vulnerable to its effect.

Project Purpose

Groundwork San Diego Chollas Creek team created a masterplan to install distributed energy resources (DERs). DERs are decentralized electricity producing local resources such as solar and wind systems that are directly connected to the grid. The masterplan is innovative, residential-scalable, and replicable, and will ensure resident access to renewable, resilient, affordable and locally-sourced electricity generation to move the entire community to near zero-net energy technologies.

The masterplan will deliver significant innovations including:

1. Among the first projects to bring the customer, community, and environmental benefits of California's Community Solar Green Tariff Program to a disadvantaged community
2. Project design to create a model for the delivery of energy and "co-energy" benefits. (public health, economic development, education; community empowerment, greenhouse gas reduction; land and water conservation) through the coordination of government funding and education programs, private investment; partner outreach coordination.
3. Recommendations for neighborhood-scale measurement and verification to provide necessary feedback loops for assessing annual zero-net energy, greenhouse gas, energy efficiency, and related goals to scale this model across San Diego low-income communities.

4. Federated system of DERs financed, constructed, owned, and managed to succeed in the competitive marketplace and aligned with the diversity of municipal approaches to achieve short and long-term climate action goals.

Project Process

Central to the project process was the participation of a skilled, knowledgeable consultant team and visionary and committed partners. These experts were selected from the public and private sectors, and they served in a variety of capacities, including communications, planning, focus groups, technical advisory committee, and subcontractors. Team members and partners supported the following key project activities:

Existing Conditions Analysis

California State University Fullerton completed a comprehensive survey (overcoming barriers to community response rooted in fears around immigration and scams) to identify residents' attitudes towards energy, equity, environmental justice, and climate change.

University of California, San Diego (UDSD) developed an innovative model to analyze project area energy consumption/use data and generation. This model establishes the benchmark for and will be used annually to measure progress towards community zero-net energy. It informed planning efforts to establish generation goals for the masterplan's federated system of DERs.

Cityworks conducted community focus groups to develop a communications plan to prepare the community for the launch of the Advanced Energy Community in Phase II. Cityworks also analyzed existing land uses to recommend DER installation sites.

San Diego Unified School District emerged as the optimal partner for hosting DER sites given the highly urbanized nature of the project area. The school district participated on the technical advisory committee, provided all necessary energy data for tariff analyses, and was a site host in the masterplan build-out.

Tariffs and Regulatory Framework

San Diego Gas and Electric (SDG&E) was central for the project's exploration of the utility's EcoShare program as a way to deliver affordable, renewable energy to disadvantaged community members. EcoShare, SDG&E Green Tariff Shared Renewable Program, is designed to provide customers, including local governments, businesses, schools, homeowners, municipal customers, and renters, new renewable energy rate options. Through this program, customers can purchase renewable energy from new community-based projects for reduced rates. There are no approved EcoShare developers to date.

The Center for Sustainable Energy prepared a report recommending a Community Solar Tariff approach for the project masterplan as an alternative to the EcoShare program. This report was the basis for comments to the California Public Utilities Commission proceedings addressing the Green Tariff and Community Solar programs,

Masterplan for Federation of Distributed Energy Resources

A combined effort of project team members Turpin and Rattan, RevSolar, UCSD Center for Energy Research, AECOM, and TTG Environmental produced the Chollas EcoVillage masterplan comprised of 2.3MW of solar energy generation and 1.2MW of storage. Site hosts included San Diego Unified School District and Northgate Gonzalez Market, as well as the Hilltop mixed use commercial development. DERs constructed on school district sites were reviewed through the school district California Environmental Quality Act (CEQA) process, and permitted by the California Division of State Architect. Northgate Gonzalez Market and Hilltop were processed through the City of San Diego CEQA and permitting processes.

These partners also assisted in the design, at one of the community solar project sites (the EarthLab), of a green energy training center to support at –risk youth in the school-to career training and education opportunities.

Replicability Through Case Study and Technology Transfer

UCSD Center for Energy Research, UCSD Center of Global Justice, and Research into Action facilitated robust regional and national project sharing venues, and Research into Action completed the Case Study.

The technical advisory committee was comprised of renewable energy organizations, municipal agencies, and SDG&E, and convened quarterly to bring experience and perspective on project components. Members and their areas of focus included:

- Blue Flame - energy generation analysis of commercial and residential property.
- Center for Sustainable Energy - policy analysis and development.
- City of San Diego: Climate Action Plan alignment and permitting.
- Cleantech San Diego - business models for clean energy solutions.
- San Diego Air Pollution Control District - legislative analysis and standards.
- SDG&E - current customer data, programs and system information.
- San Diego Unified School District - DER sites and Proposition 39 program.

Project Results

The project successfully completed a masterplan consisting of a federated system of DERs to bring affordable and accessible renewable energy to a disadvantaged community in support of transition to a zero-net energy community. Outcomes and findings that may be of significance to AECs initiatives elsewhere in California disadvantaged communities include:

- A research partner is central to developing models for establishing baseline community consumption data.
- Although an in-depth analysis reveals that the current SDG&E Green Tariff Shared Renewable program, EcoShare, does not support a commercially viable developer-sponsored project, and any AEC effort must include a close relationship with the regional IOU to access emerging community solar terms and tariffs, customer

acquisition; interconnect studies. SDG&E will be the Groundwork partner in the new Community solar tariff delivery.

- A successful AEC effort in a disadvantaged community requires a strong relationship with the municipality in order to bring government resources in support of the approved Climate Action Plan and related social equity goals.
- Only a community-based organization has the credibility at the neighborhood level to assess community attitudes and provide education and outreach services.
- A strong development partner is critical to develop concept designs and secure non-governmental funds for project market readiness.
- Institutional partners are essential in urbanized communities where insufficient open space exists for DER installations.

The project team made numerous presentations of the project findings and outcomes to energy industry professionals and government groups including Cleantech San Diego General Membership Meeting, January 2018, Electric Power Research Institute (EPRI) Annual Conference and Utility Advisory Meeting, February 2018, San Diego County K-12 Schools Sustainability Collaborative Workshop, January 2018 and the San Diego Association of Governments (SANDAG) Regional Energy Working Group on March .2018

The project team members at UCSD engaged in a variety of knowledge transfer activities to spread awareness of the zero-net energy effort in the Encanto neighborhood. They featured the project in coursework for UC students and presented at local, regional, national, and international events including the Pontifical Academy of Sciences, Vatican, Summit, November 2017, the Blum Foundation Advisory Board and the 10 University of California Blum Network, October 2017, and the Advisory Board meeting at UC San Diego Institute for Public Health. December 2017. A new UCSD undergraduate course was launched in winter 2016 (and ran again in winter 2017) called Bending the Curve, presenting the Chollas EcoVillage zero-net energy project as the central case study of university-community partnerships for advanced energy solutions in disadvantaged communities. Public lecture at the University of California, Davis, about university-community partnerships around climate justice, with the project as a model in May 2018.

Benefits to California

The project planned, designed and began preparing its community for advancement towards an AEC with unprecedented access to technology and best energy practices to optimize the economic and environmental performance of school, business and residential energy loads. The team successfully designed a masterplan for a community energy project to provide access to affordable green energy. These results will be shared throughout California and project benefits will include improved safety, reliability and lower costs for energy.

The project masterplan responded specifically to the *Senate Bill 350 (de Leon, Chapter 547, Statutes of 2015) Barriers Study* citing lack of access by disadvantaged community residents to solar generation, locally generated renewable energy, and energy efficiency and weatherization services. The build-out of the masterplan will bring together the IOU, a private sector developer,

and a community-based organization to activate a new California Community Solar Tariff, evaluating its commercial viability and serves as a model for fully monetized value streams of DERs in disadvantaged communities. It will deliver and evaluate new models of community engagement, environmental education for youth and adults, training for a new generation of green jobs, and neighborhood-scale participatory climate action. The masterplan build-out will use the Phase I Technology Resource Plan as a template for standardizing project review and evaluation in collaboration with site hosts and the IOU. The independent storage system on a school site will demonstrate the benefits to school districts (energy bill savings associated with storage in non-emergency times) and communities of activating school sites throughout the state as emergency shelters in disadvantaged communities.

CHAPTER 1:
Project Background

1.1 The Project Purpose

The Chollas EcoVillage Project is located in Encanto, a disadvantaged community located in Southeastern San Diego. The project team developed an innovative and replicable approach for accelerating an advanced energy community (AEC) in a low-income area, using a federated system of distributed energy resources (DERs). An AEC:

- meets electricity demand in a geographic area through energy efficiency and renewable energy generation in the community.
- provides benefits from improving grid reliability and resiliency to saving the cost of investments to construct new transmission and distribution lines and systems.
- results in financially attractive markets for developers, homeowners and renters.

Through the project team's planning efforts, a new and compelling narrative is emerging, positioning this disadvantaged community as creator, partner, leader, and owner of future clean energy solutions. These roles contrast the traditional limited role of a disadvantaged community as consumer only and have the potential to fundamentally change the paradigm for how clean energy futures in disadvantaged communities are achieved from planning to development to management.

California, though laws, policies and programs, is targeting disadvantaged communities for investments aimed at improving public health, quality of life and economic opportunity while at the same time reducing pollution that causes climate change. The project provides an opportunity to demonstrate how to transform California's bold commitment from a promise into a reality that increases environmental sustainability, while helping the neediest communities build successful futures.

1.2 The Challenge

Disadvantaged communities are disproportionately affected by climate change and are the most exposed populations to the impacts of poor air quality, heat waves, and extreme weather events. These challenges are compounded by more vulnerabilities such as lack of access to health care, poverty cycles, and the cumulative stresses of these factors on individuals and a community as a whole. These same communities have long been denied access to the economic, environmental, and health benefits of many energy technologies. As stated in the *SB 350 Barriers Study*, the barriers to low income and disadvantaged community access to renewables and energy efficiency is either structural or policy-related. Structural barriers include the split incentive (landlord vs renter) in the large renter markets of these communities and, when there is homeownership, the age of the housing stock that undermines installing solar systems and weatherization. Policy barriers include under-investment, lack of providing incentive tariffs, and lack of streamlining of public and private investment.

Emerging energy challenges in disadvantaged communities center around their vulnerability to the effects of climate change and their historical exclusion from the socio-economic and environmental benefits of green technologies and incentives. This central focus misses the many other opportunities disadvantaged communities present and can yield, such as:

- New opportunities for potential contributions to renewable energy and DER systems.
- A meaningful framework for developing new policies and regulations that are urgently required.
- Civic engagement solutions that address barriers to participation.
- Project models to address these challenges rapidly and broadly across the nation.

1.3 The Project Goals and Objectives

There are four goals embedded in the project's purpose:

- Create community-driven transformational climate action.
- Develop affordable and accessible renewable energy.
- Build and work through public-private AEC community partnerships.
- Provide a replicable, scalable model.

1.3.1 Create Community-Driven Transformational Climate Action

To create community-driven and transformational climate action, projects must be located in an informed, participating community that understands how to conserve energy and water; must bring new models for locally-generated renewable energy to provide affordable and reliable power to meet local demand; must use energy independence as a tool to rebuild socio-economic well-being.

Specific objectives to achieve this goal in the Chollas EcoVillage Project were to:

- Build knowledge through hyper-local, neighborhood-level, peer-to-peer engagement about energy/water efficiency and available options to that end.
- Prepare and deploy local students as project ambassadors to gain student interest in energy efficiency; help students connect their future to energy efficiency to motivate their continued interest in it as a career track; and reach the community in ways that build from its own social systems.
- Develop visualization tools and launch on-line platforms for project and energy information.
- Inspire and reinforce a new citizenship culture by developing unique public spaces for environmental education and participatory climate action, where new energy technology and community engagement meet.

1.3.2 Develop Affordable and Accessible Renewable Energy

A successfully designed AEC must provide project area members with access to affordable, renewable energy. These solutions should be generated locally to meet and match their new consumption needs. Objectives for this goal were to:

- Develop a master plan that includes site maps of the proposed DER location(s), technology construction drawings, budgets and permits, as well as the location of a facility to address survivability and resiliency of critical infrastructure during periods of grid outage and natural disasters.
- Analyze and evaluate a financial model that will consider available economic incentives including: new market tax credits (NMTC); federal investment tax credits; Self-Generation Incentive Program (SGIP); San Diego Gas and Electric (SDG&E) special purpose incentives; targeted low interest commercial loan programs; municipal bonding; property assessed clean energy (PACE) instruments; and private equity.

1.3.3 Build and Work Through Public-Private Zero-Net Energy Community Partnerships

Strategies for an AEC also include partnerships and approaches with key agencies, corporate entities, non-governmental organizations (NGOs), neighborhood planning groups, and others both inside and outside the project area boundaries. Objectives were to:

- Understand the energy/financing goals and requirements of prospective project area participants (developers, San Diego Unified School District (SDUSD), and land-owning NGOs such as faith-based institutions).
- Understand the long-term goals of the city and county for possible integration of constructed DERs.
- Identify resources and expertise to review elements of a proposed AEC.
- Engage respected community organizations and leaders in support of community efforts.

1.3.4 Provide a Replicable, Scalable Model

To accelerate AECs in other disadvantaged communities, the project provides a roadmap for the process via the final report. The project was to:

- provide a case study that details all aspects of project decision-making completed for the project including: economic, legal, regulatory, technical and environmental analyses.
- transfer technology and knowledge, so that the learning in the project can accelerate adoption.
- position the community in an ongoing leadership role to continue to demonstrate its successes and learnings.

The project goals align with and support the California Energy Commission's Electric Program, Investment Charge (EPIC) program commitment to demonstrate and use projects that promote cleaner and more reliable energy for all ratepayers. The success of the project's AEC objective depended on four factors:

- the ability to achieve energy efficiency among project area residents and businesses through their participation in climate action.
- the financial and technological viability of community energy project, by a (Senate Bill 43 [Wolk, Chapter 413, Statues of 2013]) Green Tariff Shared Renewable program (SDG&E's EcoShare) or an anticipated tariff such as the community solar tariff;
- engaging community-level and regional partners to accomplish both.
- a committed citizenry.

1.4 The Approach

The project's method depended on the leadership of an established, strong and trusted community-based organization, Groundwork San Diego. The project team worked on two tracks throughout the project phases from the existing conditions analysis through the design of specific projects. First, they engaged the community, inviting their participation and building and harnessing their interest in ways that are specific to the dynamics, opportunities and needs of this community. The team also brought the highest level of energy-related regulatory, technological, finance, and development expertise to the project to review and problem-solve complex challenges. Together, these tracks addressed these issues:

- Financial barriers were investigated by a one-on-one outreach to commercial, multi-family, and residential entities in the project area with benefits of and access to public financing for direct install energy efficiency upgrades.
- Structural barriers were addressed by one-on-one outreach to commercial, multi-family, and residential entities in the project area.
- Policy and program barriers were explored, developing an innovate approach under the Green Tariff Shared Renewable Program (GTSR).
- Community access barriers were identified from the project survey results, focus group findings, and a communications plan developed for a neighborhood-specific, customized outreach effort to educate and engage community residents, business owners, and other stakeholders.

1.4.1 Skilled, Knowledgeable Project Team

To achieve these outcomes, a skilled, knowledgeable team was organized and managed, resources were leveraged, and reality testing was conducted. A high priority was to bring resources into the community that could creatively address the funding opportunities, and to smooth the transition from planning into construction. The team was organized into three parts: a technical advisory committee, subcontractors, and partners.

1.4.1.1 Technical Advisory Committee

The technical advisory committee was comprised of renewable energy organizations, municipal agencies, and SDG&E, and convened quarterly to bring experience and perspective on project components. Members and their areas of focus included:

- Blue Flame - energy generation analysis of commercial and residential property.
- Center for Sustainable Energy - policy analysis and development.

- City of San Diego: Climate Action Plan alignment and permitting.
- Cleantech San Diego - business models for clean energy solutions.
- San Diego Air Pollution Control District - legislative analysis and standards.
- SDG&E - current customer data, programs and system information.
- San Diego Unified School District - DER sites and Proposition 39 program.

1.4.1.2 Subcontractors

A range of expertise was included on the project's sub-consulting team, including: engineering, communications, environmental planning and permitting, financial analysis, technical resources, social scientists, clean energy organizations, universities, schools, policy makers, and other professional services firms. The subcontractor team brought robust resources and expertise from across the region and included:

- AECOM-permitting
- California State University (CSU) Fullerton - survey design and implementation
- CityWorks - communications and facilitation
- Strategic Management Group - biodigester feasibility
- TTG Environmental - environmental permitting
- Turpin and Rattan - design and constructability
- UCSD - clean energy innovations research, testing, analysis, visualizations, and civic engagement (played an expanded role throughout project)
- Ventura Partners - financial resource analysis
- Research Into Action - process evaluation and best practices from across the country
- RevSolar - leading regional commercial solar company with experience in virtual net metering systems
- In3 Group - business development, project origination and finance, management consulting, financial forecasting/modeling
- Clean Spark - developer of software platform that seamlessly integrates DER
- Center for Sustainable Energy - expertise relevant to project includes the Self-Generation Incentive Program, the California Solar Initiative and the Clean Vehicle Rebate Project, as well as in zero-net energy (ZNE) strategies, California regulatory challenges, energy efficient models and financing green energy initiatives.

1.4.1.3 Partnerships

The innovative approach of the project required knowledgeable partners with national technology expertise and successful projects. The partners believed that public school districts, community-based, environmental non-government organizations (NGO), major research universities, investor-owned utilities, and the private sector have meaningful knowledge and resources to contribute to solutions that mitigate the negative effects of climate change on this community's socio-economic and natural resources. A unique partnership was essential in addressing the opportunities and challenges associated with developing the first GTSR program in California. Those partners were:

University of California, San Diego (UCSD). This partnership was central to the technology and community engagement components of the project. UCSD and its various teams and personnel

contributed across the spectrum of services development support of the AEC master plan. Specifically, the university provided: the technical resources plan, the power delivery plan, and the technical analysis underlying the community renewable energy project and the micro-grid network project. Moreover, its expertise and experience with fuel cell technology guided planning efforts to incorporate a fuel cell among the project's DER scenarios. Other UCSD teams were critical in identifying opportunities and possible matching resources to include potential electric vehicle projects in the resulting AEC master plan. Those included:

The Center for Energy Research:

- The Center for Energy Research is an organized research unit at UCSD dedicated to developing solutions for the growing challenges of energy supply and use in today's society. Its members include internationally recognized scientists, faculty from multiple UCSD departments, visiting international scholars, and students. Together, they perform basic and applied research in fusion, solar energy, fuel cells, energy storage, and related disciplines.

The Center on Global Justice:

- The Center of Global Justice is an organized research unit at UCSD and facilitates community-engaged interdisciplinary research on poverty, social disparity and human rights throughout the region and world. The Center's projects are cross-sector and include diverse researchers from the social sciences and policy, arts and humanities, engineering and technology, medicine, the physical sciences and business.

The Center for Strategic Energy Initiatives:

- The Center for Strategic Energy Initiatives creates funded demonstration and research opportunities for innovative clean energy technologies. Strategic Energy Initiatives engages the private sector to establish significant cost sharing agreements to support campus projects, and works with community nongovernmental organizations (NGOs) in technology transfer.

San Diego Unified School District (SDUSD). With seven school sites in the project area, SDUSD emerged as a central and crucial entity to crafting a partnership that could open opportunity and accessibility to renewable energy for the community. The district has a track record of leading programs that reduce energy and water use, increase recycling levels, develop solar energy partnerships, create educational resources, and support green initiatives. Examples of this leadership are its Energy Star ratings, Collaborative for High Performance Schools, and material reuse. Given the significant potential of the seven schools in the project area to meet AEC and ZNE generation goals though rooftop. Carport, and open space, and the necessity to reduce demand at these sites (annual electrical load of 3,677 MW), SDUSD was approached early on to consider site hosting for community solar at one of its schools and as an institutional subscriber to the proposed GTSR program.

City of San Diego. The AEC planning easily aligned with the city's ongoing initiatives to reduce greenhouse carbon gas emissions in disadvantaged communities. Although one early project

scenario involving a bio-digester at a municipal waste site did not evolve due to community and city competing interests, a new focus on the launch of a community choice aggregation entity did. This result allows the development of a renewable energy program option that creates access to green energy for the area's residents and provides an early demonstration site for the city to create community choice aggregation.

1.4.1.4 Leveraged Resources

Groundwork San Diego was able to apply existing funding to expand the project's energy efficiency and residential generation goals, and to secure new funding for those purposes. Specifically:

- A California Department of Water Resources grant award to bring water conservation upgrades (rain barrels, water saving devices, drought tolerant landscapes, greywater systems) to 50 homes in the project area. Groundwork used the opportunity to educate residents about the relationship of water savings to their electricity consumption, and to promote solar installations (15 homes were solarized) and weatherization (30 homes received weatherization audits and improvements such as weather-stripping). The initiative provided Groundwork San Diego with innovative outreach tools (neighborhood and faith based water/energy workshops), and an opportunity to integrate agency outreach services (Grid Alternatives, Low Income Weatherization Program, San Diego County Water Authority, SDG&E), a coordination/streamlining approach called for in the *SB 350 Barriers Study.*
- The team also leveraged funding by SDG&E and the Environmental Protection Agency in support of a large-scale climate action education program.

1.4.1.5 Reality Testing

It was essential to work with the residents at a neighborhood-level to test the viability of the proposed solutions, and ensure the final projects were tailored to meet actual needs, provide benefits that are relevant to this community, and feasible.

The *SB 350 Low-income Barriers Study* provided a roadmap to explore and respond to the challenges and create an AEC in a disadvantaged community. Specifically, this study's reported barriers—financial, structural, policy, and community access—were obtained by direct observation or "ground-truthed" throughout the project's planning process. Where validated, potential solutions to these barriers were investigated and included in the final master plan, included in Chapter 4 of this report.

1.5 Report Organization

The report has been organized in the following manner:

Chapter 1: Provides an overall summary of the project's objectives and goals.

Chapter 2: Defines project area using land use and socioeconomic metrics.

Chapter 3: Provides AEC vision.

Chapter 4: Master plan defines project components and path forward.

Chapter 5: Provides a review and strategies for knowledge and technology transfer.

CHAPTER 2:
Existing Conditions

2.1 Introduction

This existing conditions analysis informs planning efforts and provides the analytical underpinning for a range of potential strategies that were tested in Chapter 3: ACE Visioning. Ultimately, that testing created the framework for specific projects and program activities defined in Chapter 4: The Master Plan.

This chapter covers the:

- Project Location: physical context, watershed, promise zone, and land uses (Section 2.2)
- Resource Consumption Profile of the Community (Section 2.3)
    - Energy
    - Water
    - Electric Vehicle Participation
    - Waste
- AEC Existing Conditions Analysis (Section 2.4)
    - Participating community characteristics
    - ZNE existing assets and opportunities
    - Public safety
- Key Findings (Section 2.5)

2.2 Project Location

2.2.1 Physical Boundaries

Located in the heart of the Chollas Creek Watershed, only five miles from downtown San Diego, the Chollas EcoVillage (the project area) is bordered by I-805 to the west, Euclid Avenue to the east, SR-94 to the north, and Logan Avenue to the south (Figure 1).

Figure 1: The Project Area

Credit: Groundworks

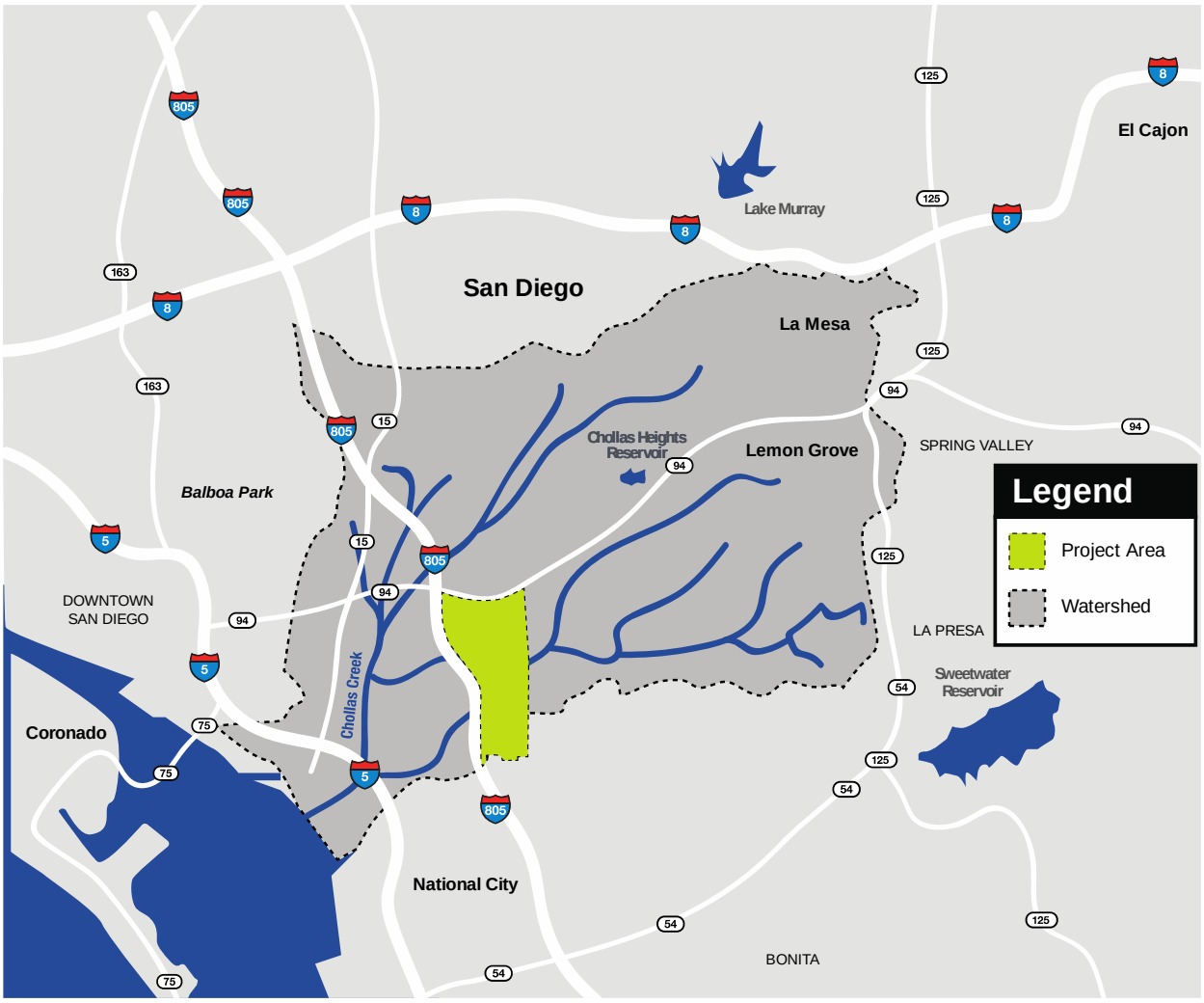
2.2.2 The Chollas Creek Watershed

The 10-square mile watershed is characterized by four main branches of Chollas Creek, all empty into San Diego Bay as depicted in Figure 2.

2.2.3 San Diego Promise Zone

The San Diego Promise Zone (SDPZ) overlays much of the project area (Figure 3). This zone includes three of the City's most economically disadvantaged neighborhoods. SDPZ is characterized by high unemployment, low educational attainment, insufficient access to healthy foods, concentrated poverty, rising crime, and the least affordable housing in the nation. This zone offers the project and related energy projects in the watershed significant opportunities for federal funding.

Figure 2: The Project Area Within the Chollas Creek Watershed



Source: Groundworks

Figure 3: The San Diego Promise Zone

Source: Groundworks

2.2.4 Land Uses

In addition to being located in the Chollas Creek Watershed, the project area is in the middle of San Diego's Encanto Neighborhood Planning Area. In the last decade, the Encanto area has transitioned from a former industrial area to a mixed-use, smart-growth transit corridor served by two high-use light-rail and intermodal regional bus stations. It is an older, urban, built-out disadvantaged community, characterized by a range of challenges to a community ZNE master plan. The project area consists of a mixture of residential and non-residential uses including gas stations, fire stations shopping centers, medical offices, warehouses, and schools including:

- An aged housing stock.
- Built-out residential areas.
- Under-developed commercial areas.
- Depressed socio-economic conditions.
- Limited public/private investment

These physical and social conditions framed the landscape and environment that, in turn, informed the master plan design. For example, given the conditions of many pre-1960s homes, it was determined that:

- It is unrealistic to forecast significant increases to adopting solar rooftop systems.
- There is limited private, commercial areas available for ground-mounted solar photovoltaics (PV) systems
- Other possibilities such as public sector properties should be explored.
- Additionally, existing socio-economic conditions made it obvious to find a community energy solution that did not require residents to pay upfront costs to participate such as community rooftop PV system (Figure 4).

Figure 4: An Example of Community Rooftop Solar

Credit: Groundworks San Diego

2.3 Resource Consumption Profile

2.3.1 Resource Consumption Profile - Energy Consumption

Three main customer types in the project area were analyzed: residential, commercial and schools. The energy load of residential, commercial and schools is described, followed by the cumulative total.

2.3.1.1 Residential and Commercial

SDG&E provided actual 1-hour customer load data from metered data for residential and commercial customers within the project area for 2013 – 2016. SDG&E retained customer privacy and met data security requirements by removing the customer addresses. SDUSD also provided its consumption data for analysis. The detailed analysis of this data can be found in the Appendix A-2b: Technology Resource Plan.

In the project area, there are 2,026 residential, individual meters assigned to SDG&E customers; 52% of these customers are in the CARE program, a bill assistance program available to low-

income customers meeting eligibility requirements. Additionally, there are 138 commercial customers.

2.3.1.2 Schools

Table 1 displays the individual energy consumption of SDUSD schools in the project area and within the disadvantaged community, the public school system is clearly the largest user of energy.

Table 1: Energy Consumption by Schools

School	Annual Grid Purchase	Annual Solar Generation	2017 Usage
Mead Elementary	340,714	0	340,714
Chollas Elementary	222,201	0	222,201
Millennial Tech	372,527	0	372,527
Horton Elementary	96,483	195,721	292,204
Porter Elementary (s)	247,705	55,176	302,881
Porter Elementary (n)	253,036	64,371	217,407
Lincoln High	2,423,190	300,000	2,423,190
Subtotal SDUSD in Project Area	3,955,856	615,268	4,271,124
Gompers Prep	631,922	0	631,922
Total	4,587,778	615,268	4,903,046

Gompers Preparatory Academy is a charter school located on SDUSD property; it is included after the sums of the traditional SDUSD schools are added together.) Within the disadvantaged community, the public school system is clearly the largest user of energy.

Source: Chollas EcoVillage Project Technology Resource Plan

2.3.1.3 Cumulative Load

Based on the preliminary analysis using the community load data provided by SDG&E, the community has a maximum, or “peak,” electrical power load of approximately 3.1 MW and a minimum load of 1.1 MW. The annual electrical energy consumption of the community based on SDG&E metered historical data is 15.6 gigawatt hours (GWh). Table 2 describes the community energy consumption level plus the energy use associated with the project area’s schools.

Table 2: Community Energy Profile

Annual Load by Customer Type 2016: SDG&E Data and SDUSD Data				
Type	Annual Min. Load kW	Annual Max Load kW	Annual Mean Load kW	Annual Total Energy kW
Residential	588	2062	972	8,514,720
Commercial	148	457	258	2,260,080
Schools	275	851	481	4,903,046
Community	1,011	3370	1,711	15,667,846

Source: Chollas EcoVillage Project Technology Resource Plan

2.3.2 Resource Consumption Profile - Water

The relationship of water conservation to energy use at the state and national levels (cost of generating large scale energy resources) is clear and compelling. The water/energy nexus at the neighborhood scale also has clear implications for the project's ZNE energy efficiency goals. As revealed by the Smarter House.org (https://smarterhouse.org/water-heating/energy-saving-tips), water-saving showerheads and faucet aerators can cut hot water use in half. By installing new showerheads, a family of four can save 14,000 gallons of water a year and the energy required to heat it!

Leveraging a grant from the California Department of Water Resources (DWR), Groundwork San Diego conducted residential water audits and installed conservation upgrades to 50 homes in the project area. Although survey results showed the residents understood the links between water and energy, no homes assessed were using water conservation upgrades. Groundwork San Diego will scale up the DWR Pilot Project.

2.3.3 Resource Consumption Profile – Electric Vehicle Transportation

Transportation represents 55% of the City of San Diego's emission inventory as documented in its approved Climate Action Plan. Transportation and zero emission vehicles strategies are critical to address climate change in San Diego's communities. Anticipating these widespread changes in San Diego's regional transportation approach, integrating electric vehicles (EVs), with supporting infrastructure (charging stations and home charging installations) are features that define an AEC. A ZNE effort must account for how electric vehicles will be powered in disadvantaged communities while meeting the energy efficiency goals.

Already, the San Diego region is recognized as a national leader in adopting these vehicles with more than 7,000 plug-in electric vehicles (PEV) and about 500 publicly available charging stations. Yet, the project area, consistent with other disadvantaged communities, exhibits low EV numbers. Between March 2016 and September 2017, **less than 1%** of San Diego Clean

Vehicle Rebate Program rebates went to residents in the project area[1]. Currently, there are no public charging stations within the project area.

2.3.4 Resource Consumption Profile - Waste

The project area is adjacent to a closed landfill facility, Chollas Landfill. The Chollas EcoVillage Project focused on creating a multi-technology combination of different, renewable energy technologies for electricity generation including anaerobic digestion with biogas, solar PV and storage elements. It was estimated that the biogas generated from an anaerobic digester could meet the electrical load peaks and variations and produce at least 50% of the project's total energy demand. A site was identified in the currently closed Chollas Landfill that could serve the project's needs, in addition to addressing the City's climate action and waste goals (Chapter 3 for analysis).

2.4 AEC Existing Conditions Analysis

An analysis of existing conditions led to tailored ZNE strategies.

2.4.1 Participatory Community Characteristics

The first part of this analysis focuses on the community members and includes socio-economic conditions, community attitudes, energy programs targeted to this community and energy generation by this community

2.4.1.1 Socio-Economic Conditions

Encanto's Area Median Income of $35,000 is approximately half that of the overall region with more than 25% of its residents living below the federal poverty level. Students enrolled in the elementary and middle schools in Encanto are 85% to 100% eligible for free/reduced price meals. Encanto's socio-economic conditions are characterized by:

- Cultural diversity: 60% Hispanic, 22% African American, and 13% Asian[2].
- Younger population: One-third of its population is under 18 and nearly two-thirds are under 35 years.
- Economic disadvantage: Below-average household income and above-average high school dropout rates makes education and workforce development essential.
- Majority renters: Specialized outreach is necessary to reach owners and managers of apartments, residents of single-family homes and multi-family residents

Residents have long-endured the effects of freeway expansion, channeling creeks, and urban sprawl. In the last decade the area began to transition from an industrial area to a designated mixed-use, smart-growth transit corridor served by two high use light-rail and intermodal regional bus stations. The project area is within three census tracts Figures 5 and 6.

[1] As reported by the California Air Resources Board's Clean Vehicle Rebate Program Statistics.

[2] SANDAG, Current Estimates Demographic & Socio Economic Estimates Census Tract 33.05, 33.05, 34.04).

Table 3 presents the California Environmental Screen data for the project area's three census tracts.

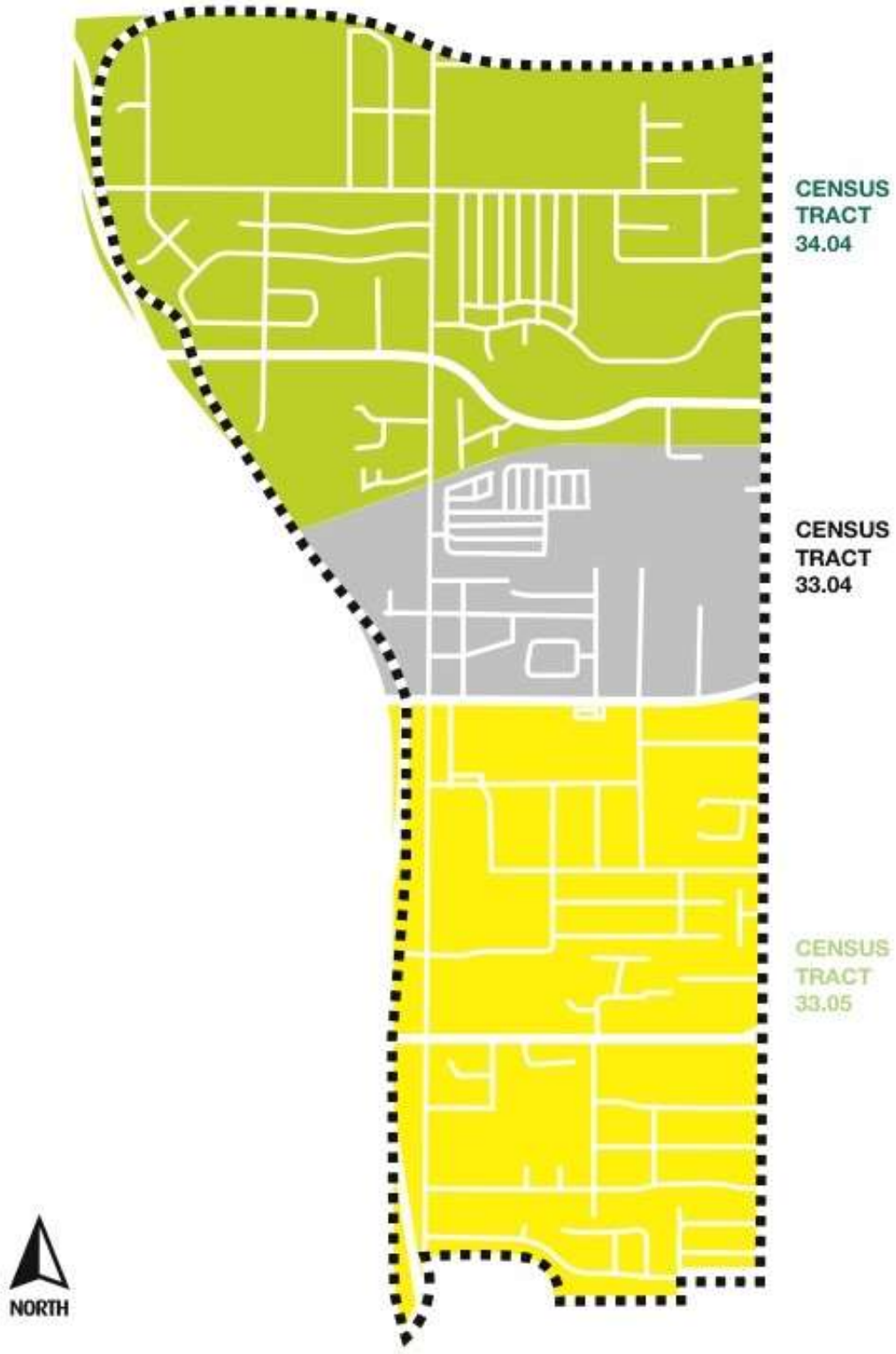
2.4.1.2 Community Attitudes

Project area residents are interested in programs and solutions to combat climate change, however they lack a solid foundation of understanding and knowledge of these issues. The information gap creates barriers to community members fully embracing AEC strategies. A community survey was conducted to pinpoint the level of understanding—or misunderstanding—concerning these issues, however, it is important to put the survey in a larger national framework before reviewing its results,

National Attitudes

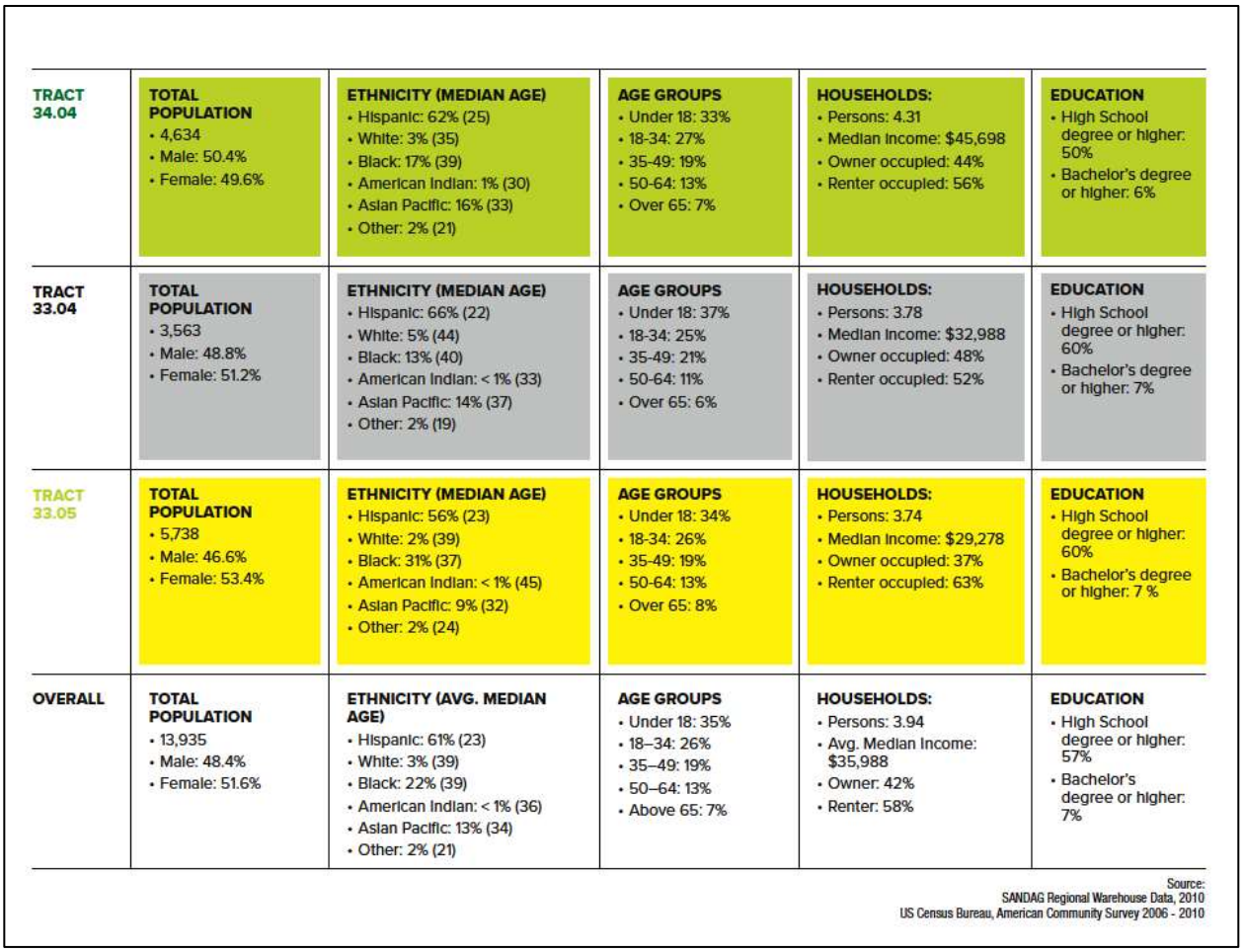
Challenges and barriers to a disadvantaged community embracing AEC opportunities and support, particularly in a community as diverse as this one, can be put into a larger context through a scan of national studies and reviews. As revealed in the Yale University School of Forestry and Environmental Studies Race, Ethnicity, and Public Responses to Climate Change report (http://environment.yale.edu/climate-communication-OFF/files/Race_Ethnicity_and_Climate_Change_2.pdf), minorities often support actions to combat climate change at levels equal to or greater than non-minorities. A poll recently released by Green For All and the Natural Resources Defense Council (https://www.greenforall.org/themes_and_findings_from_a_survey_of_african_americans_on_climate_and_clean_energy) finds that two-thirds of African Americans believe global warming is a serious problem, they want action more than the population-at-large, and they overwhelmingly believe that shifting to clean energy will create jobs and reduce electricity bills.

Figure 5: Chollas EcoVillage Project Area Census Tracts



Source:Groundworks

Figure 6: The Project Area Demographics by Census Tracts



TRACT 34.04	**TOTAL POPULATION** • 4,634 • Male: 50.4% • Female: 49.6%	**ETHNICITY (MEDIAN AGE)** • Hispanic: 62% (25) • White: 3% (35) • Black: 17% (39) • American Indian: 1% (30) • Asian Pacific: 16% (33) • Other: 2% (21)	**AGE GROUPS** • Under 18: 33% • 18-34: 27% • 35-49: 19% • 50-64: 13% • Over 65: 7%	**HOUSEHOLDS:** • Persons: 4.31 • Median Income: $45,698 • Owner occupied: 44% • Renter occupied: 56%	**EDUCATION** • High School degree or higher: 50% • Bachelor's degree or higher: 6%
TRACT 33.04	**TOTAL POPULATION** • 3,563 • Male: 48.8% • Female: 51.2%	**ETHNICITY (MEDIAN AGE)** • Hispanic: 66% (22) • White: 5% (44) • Black: 13% (40) • American Indian: < 1% (33) • Asian Pacific: 14% (37) • Other: 2% (19)	**AGE GROUPS** • Under 18: 37% • 18-34: 25% • 35-49: 21% • 50-64: 11% • Over 65: 6%	**HOUSEHOLDS:** • Persons: 3.78 • Median Income: $32,988 • Owner occupied: 48% • Renter occupied: 52%	**EDUCATION** • High School degree or higher: 60% • Bachelor's degree or higher: 7%
TRACT 33.05	**TOTAL POPULATION** • 5,738 • Male: 46.6% • Female: 53.4%	**ETHNICITY (MEDIAN AGE)** • Hispanic: 56% (23) • White: 2% (39) • Black: 31% (37) • American Indian: < 1% (45) • Asian Pacific: 9% (32) • Other: 2% (24)	**AGE GROUPS** • Under 18: 34% • 18-34: 26% • 35-49: 19% • 50-64: 13% • Over 65: 8%	**HOUSEHOLDS:** • Persons: 3.74 • Median Income: $29,278 • Owner occupied: 37% • Renter occupied: 63%	**EDUCATION** • High School degree or higher: 60% • Bachelor's degree or higher: 7 %
OVERALL	**TOTAL POPULATION** • 13,935 • Male: 48.4% • Female: 51.6%	**ETHNICITY (AVG. MEDIAN AGE)** • Hispanic: 61% (23) • White: 3% (39) • Black: 22% (39) • American Indian: < 1% (36) • Asian Pacific: 13% (34) • Other: 2% (21)	**AGE GROUPS** • Under 18: 35% • 18–34: 26% • 35–49: 19% • 50–64: 13% • Above 65: 7%	**HOUSEHOLDS:** • Persons: 3.94 • Avg. Median Income: $35,988 • Owner: 42% • Renter: 58%	**EDUCATION** • High School degree or higher: 57% • Bachelor's degree or higher: 7%

Source:
SANDAG Regional Warehouse Data, 2010
US Census Bureau, American Community Survey 2006 - 2010

Source: Groundworks

Table 3: California Environmental Screen Data for Census Tracts in the Promise Area

	Census Tracts		
	6073303404	6073003305	6073003304
CalEnviroScreen 3.0 Percentile	75-80%	76-80%	61-65%
Pollution Burden	61	50	48
Population Characteristics Percentile	81	87	62
Ozone	26	26	26
PM 2.5:	66	66	66
Diesel	87	87	87
Pesticides	0	0	0

Toxic Releases	41	44	41
Traffic	94	85	80
Drinking Water	22	34	22
Clean ups	69	39	56
Groundwater Threats	83	55	83
Hazardous Waste	16	16	16
Impaired Water	0	29	0
Solid Waste	37	0	0
Asthma	87	78	56
Low Birth Weight	41	88	77
Cardiovascular Disease	40	16	5
Education	89	85	87
Linguistic Isolation	81	89	57
Poverty	90	85	94
Unemployment	81	93	57
Housing Burden	84	97	55
Population Size	4415 people	5743	3451
Land Area	.6 sq. miles	.5 sq. miles	.5 sq. miles
Age Statistics	n/a	n/a	n/a
Under 18 years old	30%	32%	30%
18-64 years old	64%	61%	62%
65 or older	6%	6%	8%
Poverty Rates	n/a	n/a	n/a
@ 100% poverty level	20%	31%	21%
@ 200% poverty level	48%	63%	53%

Source: CalEnviroScreen 3.0

Community Attitudes - Survey Design

To test these national findings against the project area opinions and understandings, the Social Science Research Center (SSRC) at California State University (CSU) Fullerton established a "baseline" for community knowledge, desires, goals and willingness to participate by this community's neighborhood residents regarding their knowledge, attitudes, and behaviors

towards residential energy and water conservation. This survey laid the foundation for understanding the Encanto's disadvantaged community issues and challenges regarding environmental concerns, and provided a framework for ongoing, community-oriented programming delivered by a "trusted, community-based organization."

Survey respondents were asked approximately 40 questions about their knowledge, attitudes, and behaviors towards residential energy conservation including: home and household description, their awareness of environmental issues, family water use, awareness of community water needs, family energy use, and knowledge of ways to improve energy efficiency.

The SSRC conducted surveys through multiple modes, including telephone, web, mail, and in-person, to ensure complete coverage of the area and maximize response rate. The final survey was programmed for in-person, online, and telephone administration into Qualtrics survey software.

- Survey Timeframe: March 13, 2017 through October 21, 2017.
- Survey Breakdown: 386 surveys were completed
    - More than two-thirds (n = 265; 68.7%) of these conducted in-person.
    - About a quarter by telephone (n = 89; 23.1%).
    - Smaller proportions completed online (n = 28; 7.3%).
    - By mail (n = 4; 1.0%).

Community Attitudes – Survey Findings

From this survey, significant findings about community attitudes emerged:

- This community is very concerned about global warming.
- There is a recognition that human activity contributes to global warming.
- Residents feel a personal responsibility to conserve water and energy; however, more information is required on ways to conserve/reduce.
- Residents plan on continuing to take steps to reduce energy consumption in their homes such as "buying energy efficient products."
- Members of this community, as reflected by the study sample, harbor distrust of the media, the government, and persons with authority.

This is a community ready and motivated to participate in climate action and prepared for the behavioral and energy delivery system changes central to such change.

Appendix A-2a contains the complete the survey, methods and procedures used to complete surveys with the members of the study sample, and results.

2.4.1.3 Energy Programs Targeted to This Community

The project area's residents have access to energy efficiency (EE) programs offered by SDG&E. Penetration by the lowest income (CARE-eligible) residents is high, and affords this group access to such programs and measures as:

- New EE lighting.

- Repair or replacement of doors and windows.
- Microwaves, water heaters, refrigerators and high-efficiency clothes washers.
- Insulation, weather-stripping and caulking to lower heating and cooling costs.

Using EE offerings by the investor-owned utility (IOU) to non-CARE residents, however, is limited, given the barriers of income restrictions and wariness about engaging in public programs in the current immigration environment.

2.4.1.4 Energy Efficiency and Generation

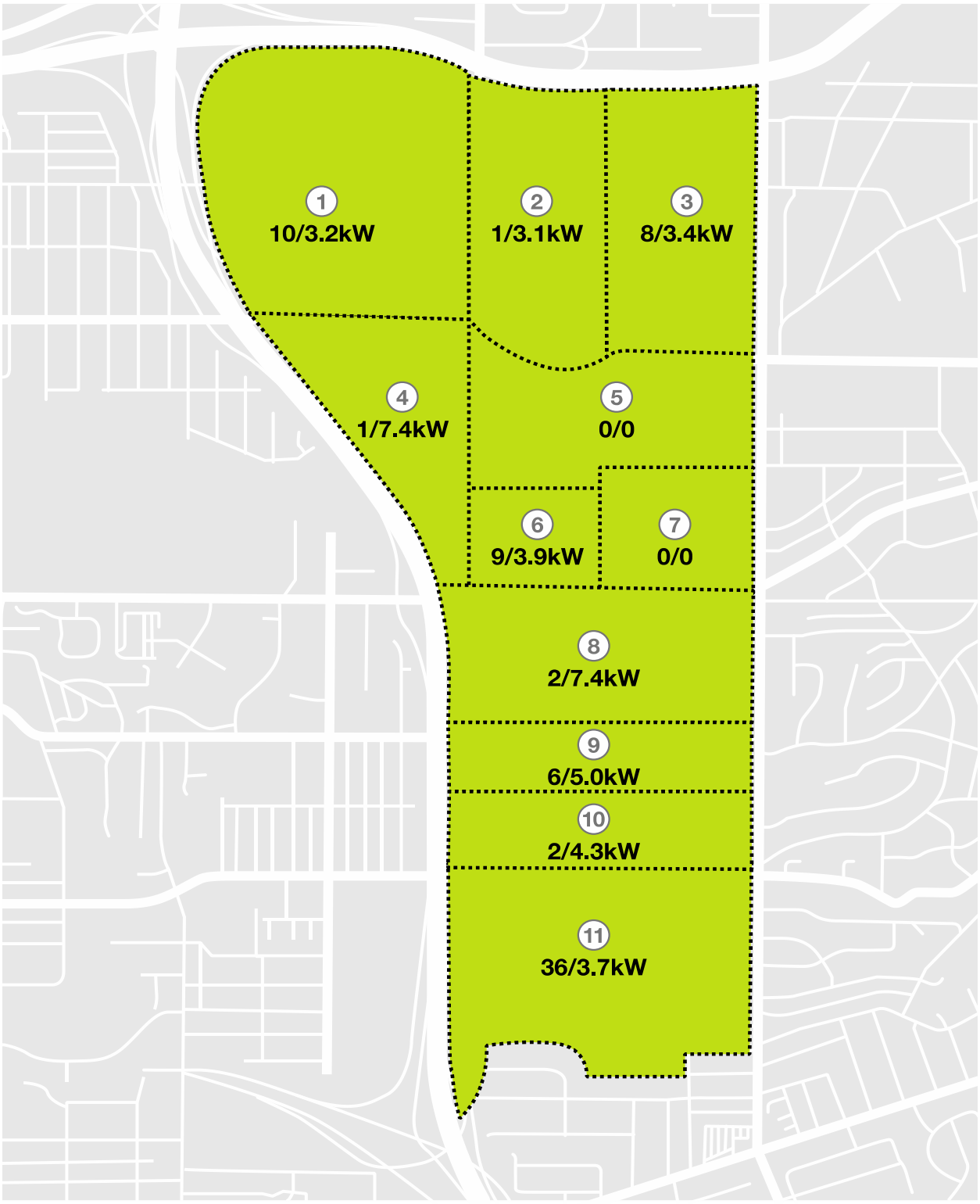
Minimal Rooftop Penetration

The project area has seen only minimal installations of rooftop solar PV systems. There is a total of 332.5 kW of existing rooftop PV, or a 3% penetration, for the project area. In comparison, the current penetration of residential rooftop solar city-wide is estimated at 25% as shown in Figure 7. The map in Figure 8 indicates existing number of properties with PV in the project area and the energy generation.

Figure 7: PV Solar: City-Wide Comparison to Project Area

Source: ohmhomenow.com/california-solar-penetration-reaches-7-2-in-2016/

Figure 8: Existing Roof Top PV Solar



Source: Groundworks

The existing conditions analysis verified this low solar PV penetration rate is attributable to:

- The inability of disadvantaged community residents to afford, acquire or finance such systems.
- The conditions of older homes that preclude the installation of solar PV systems at affordable cost levels.

Financial Barriers to Rooftop Solar

Groundwork San Diego is collaborating with Grid Alternatives, although their program reach is limited and the income-eligible pool of homeowners is small, to facilitate financing for other homeowners. Unfortunately, so far, absentee homeowners have been unresponsive to the Groundwork San Diego's marketing efforts.

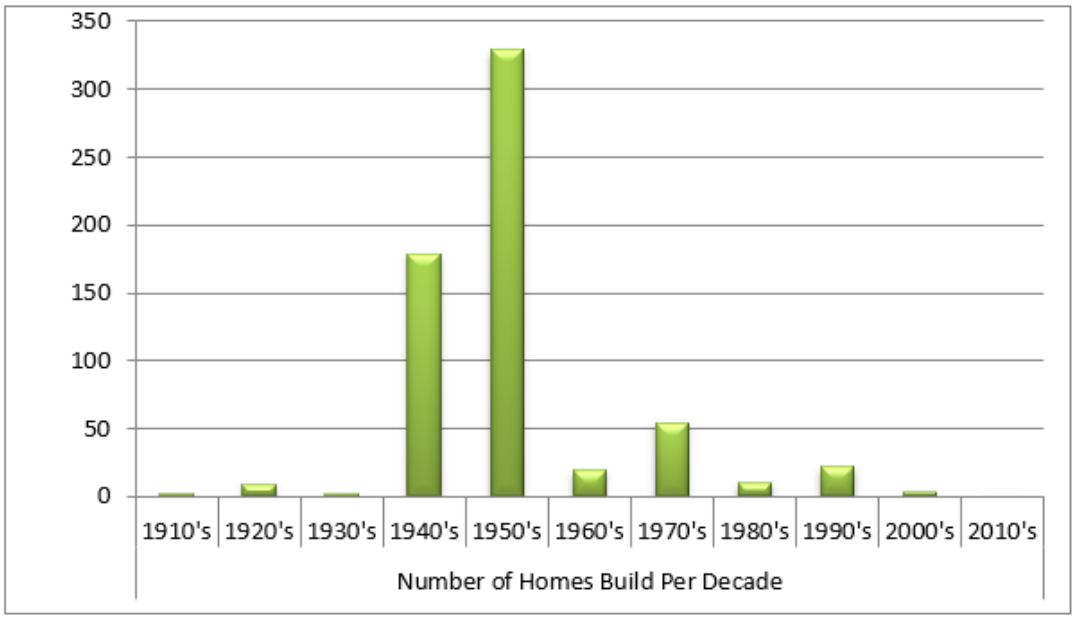
Capacity of Housing Stock for Rooftop Solar:

The project area's housing stock is comprised of older homes, many predating the 1960s. These conditions present basic challenges such as:

- Roofs that cannot support the addition of solar PV rooftop systems.
- Current electrical panels that are unable to handle the generation from PV systems.

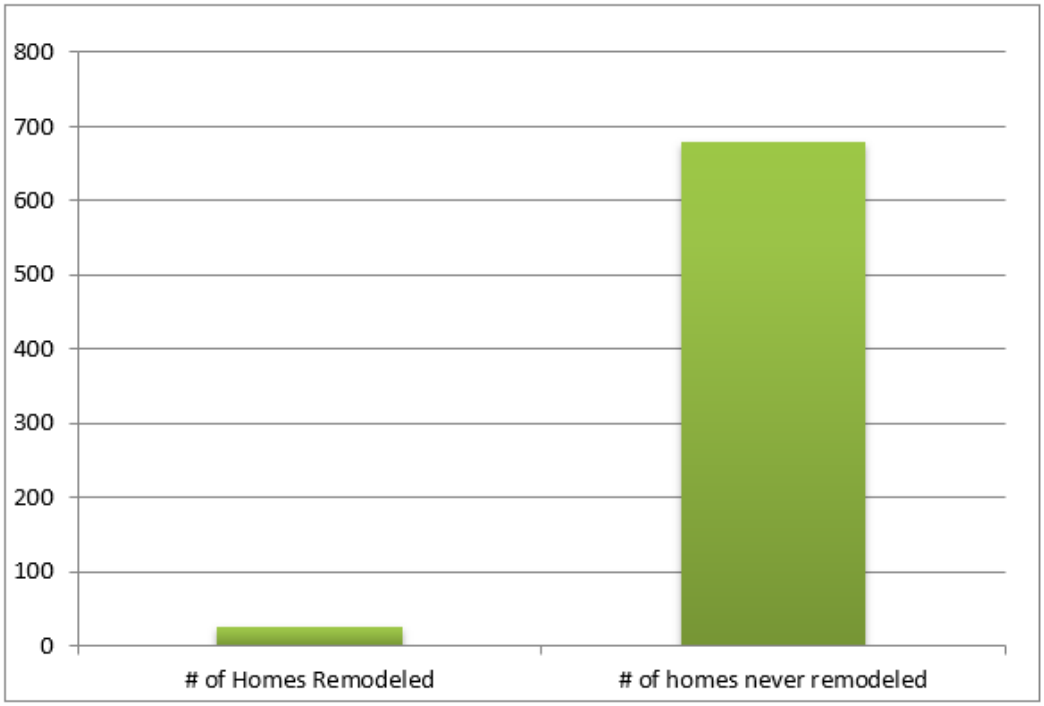
While the entire housing stock of the project area was not inventoried, examining one census tract was conducted to determine relevant housing characteristics. For the census tract that was inventoried, it was determined that most of the homes (80.7%) were built between the 1940s and the 1950s (Figure 9). Figure 10 describes the number of residences remodeled in the sample area. From the research it was also determined that a majority of homes have not been remodeled since being built (96.3% never remodeled).

Figure 9: Number of Homes Built Per Decade Over the Last Century



Source: Groundworks

Figure 10: Number of Homes Remodeled and Not Remodeled in Sectors 1-4



Source: Groundworks

2.4.2 Existing Assets and Opportunities

This section analyzes individual assets, community assets and schools, including:

- Individual assets: residential and commercial units
- Community assets: sites that could help meet energy needs for those who cannot generate on their own sites, future development, and the existing regulatory framework for these potential community sites
- Schools

2.4.2.1 Individual Assets

There are a total of 1,853 residential use buildings consisting of 908 single-family homes, 721 multi-family homes and 224 mobile homes (Figure 11).

Figure 11: Examples of Residential Development in the Project Area

2.4.2.2 Community Assets

Community assets were explored that could become a site making available energy beyond its own property and providing residents and businesses with renewable energy they cannot generate. The team analyzed these existing conditions:

- Existing community assets as opportunity sites,

- Future community assets by way of new development that will continue in the project area,
- Existing regulatory framework.

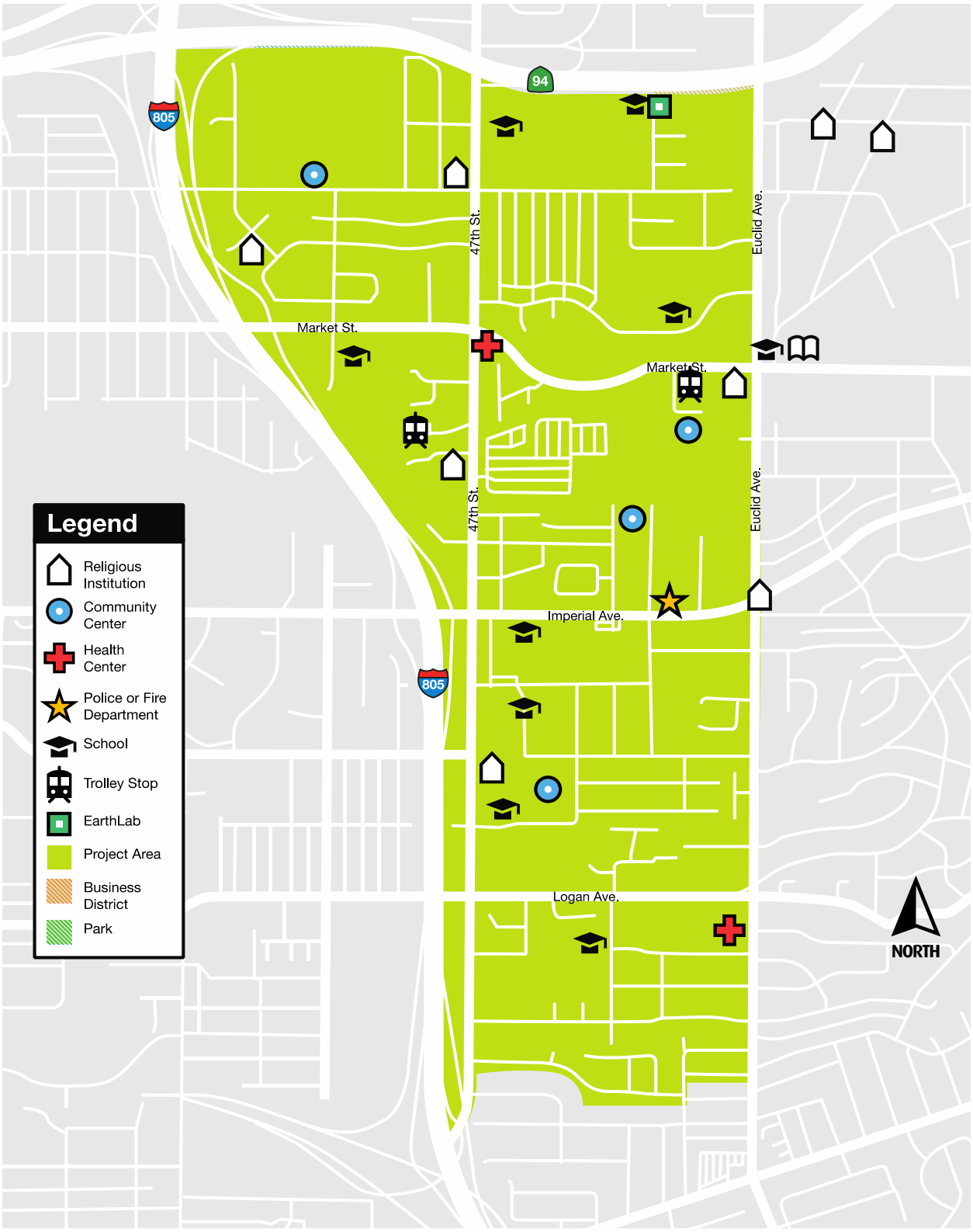
Existing Community Assets

The project area is home to numerous establishments and institutions that serve as the new models of public participation, energy efficiency, and climate action. Community assets are mapped in Figure 12.

Two main community assets are:

- Schools which create opportunities to:
    - Locate DER facilities within a community, giving them a new role, capitalizing on their existing infrastructure and reinforcing their importance in neighborhoods.
    - Reinforce an ethic among youth for longer-term, lifestyle oriented behavior change.
    - Reach families through youth ambassadors increasing awareness and motivating behavior change.
- Earth Lab, a resource unmatched in the region:
    - Is a four acre open-air, environmental classroom which is an emerging center for conservation education for area families and the project's hub for environmental education and climate action.
    - Collaborates with UCSD and the SDUSD to provide high quality environmental and science, technology, engineering and math (STEM) education to thousands of at-risk-youth each year.
    - Is a potential location for new advanced energy infrastructure that could provide a community energy solution (Figures 13 and 14).

Figure 12: Project Area's Asset Map



Source: Groundworks

Figure 13: Earth Lab – A UCSD Community Station – Master Plan

Source: UCSD EarthLab

Figure 14: Earth Lab – A UCSD Community Station – Existing View

Credit: UCSD EarthLab

Future Development

Within the project area are 62 acres of undeveloped land, currently designated for housing and commercial development. These anticipated projects present significant opportunities to participate in a ZNE strategy, including wide-scale energy efficiency and energy generation such as solar, microgrids and virtual net metering.

Two projects highlighted represent the types and ranges of development that will continue to occur in the project area in the foreseeable future:

- **Jacobs Center for Neighborhood Innovation Town Center.** The Jacobs Center for Neighborhood Innovation (JCNI) is currently redeveloping approximately 50 acres of land over the next ten years in the Encanto neighborhood. JCNI has a goal to sustainably

redevelop the land while providing essential services, housing, and commercial and service enterprises to its community. The planned Town Center (Figure 15) will be comprised of development nodes that include neighborhood-serving retail, place-making commercial, mixed-income residential, relevant community facilities, public open space and sustainable infrastructure improvements. Additionally, the Town Center will serve as a transit-oriented hub of community activity since the second busiest trolley and intermodal bus transit station in the City of San Diego is located at the corner of Euclid Avenue and Market Street.

- **Hilltop and Euclid Development**. Another planned project is a mixed-used development at the corner of Hilltop and Euclid within the Encanto neighborhood (Figure 16). Affirmed Housing is proposing to develop a high quality, mixed-use project providing retail and affordable and market-rate homes. The proposed project will include 47 market rate, single-family homes for-sale, 84 affordable apartments for families who earn 50%-60% of the area median income, 8,300 square feet of retail space, and a park that can be used for local events such as a farmers' market. The existing arroyo that bisects the site is planned to become the focal point, uniting the east and west sides of the development into a cohesive place with a pedestrian bridge. Drought-tolerant landscaping is proposed, as well as a building façade design that blends the development with the surrounding community.

Figure 15: JCNI Proposed Town Center

Source: Groundworks

Figure 16: Hilltop and Euclid Project by Affirmed Housing

Source: Affirmed Housing, Studio E Architects

Existing Regulatory Framework for Community Renewable Projects

To provide a pathway for community ZNE efforts, Groundwork San Diego was to identify and pursue a community energy project. Currently only one regulatory pathway exists in California - the Green Tariff Shared Renewable (GTSR) - which provides for and allows community access to renewable energy without owning a renewable energy system.

Green Tariff Shared Renewable Framework
The GTSR Program:

- Expands access "to all eligible renewable energy resources to all ratepayers who are currently unable to access the benefits of onsite generation."
- "Creates a mechanism whereby institutional customers…commercial customers and groups of individuals . . . can meet their needs with electrical generation from eligible renewable energy resources."
- "Provides support for enhanced community renewables programs to facilitate development of eligible renewable resource projects located close to the source of demand."

The GTSR program will ensure that those utility customers not participating in GTSR will not bear any of the costs of GTSR. The GTSR program is designed to allow PG&E, SCE and SDG&E customers to receive 50% - 100% of their electricity demand from solar generation. The program has a capped enrollment of 600 megawatts (MW) statewide. The energy procured through GTSR (100 MW) must be sited in areas identified by the CalEnviroScreen tool as being one of the 20% most disadvantaged census tracts in each IOU's service territory.

The GTSR program has two components:

- Under the Green Tariff, a customer may pay the difference between their current generation charge and a charge that reflects the cost of procuring 50% to 100% solar generation for their electricity needs.
- Under Enhanced Community Renewables, a customer agrees to purchase a share of a local solar project directly from a solar developer, and in exchange will receive a credit from their utility for the customer's avoided generation procurement and for their share of the benefit of the solar development to the utility.

Neither of these program components is dedicated to the overall 600MW cap.

Community Renewable Program - EcoShare

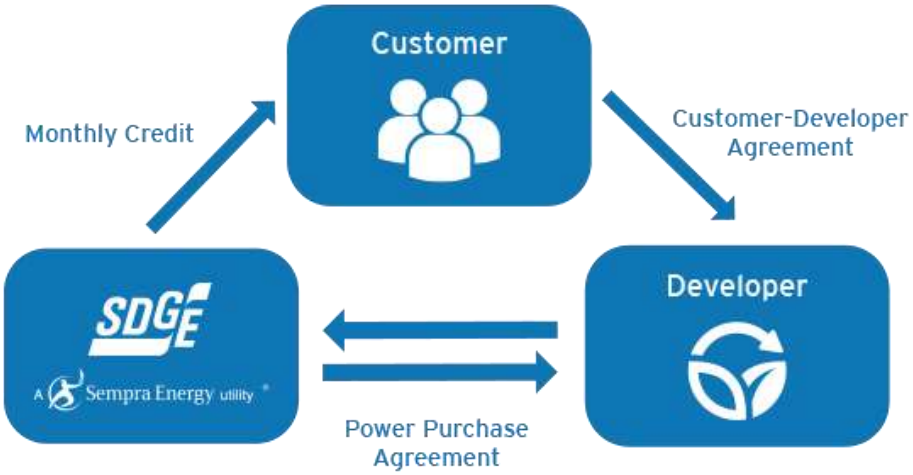
EcoShare is the SDG&E Green Tariff Shared Renweable program. EcoShare brings community renewables to SDG&E customers. Through EcoShare a third-party renewable energy developer purchases the rights to a portion of the energy generated from a new renewable energy facility. A private agreement is entered into with the developer, known as a customer-developer agreement (CDA), where the electricity price and agreement terms are defined. Participating developers also enter into a power purchase agreement (PPA), and are paid only for energy generated in excess of what customers have purchased.

EcoShare participants will receive two bills each month:

- Their normal SDG&E bill with a credit reflecting the amount of renewable energy purchased from the developer.
- A bill from the developer to for the locally-generated renewable energy

These two bills combined should result in a lower overall energy bill for the EcoShare customer. EcoShare enrollment is managed through a renewable energy developer. A minimum one-year agreement is required and termination fees may apply. The analysis of this program's capacity to be realized in The Project is in Chapter 3. The EcoShare program is the only program currently in place that would offer a community energy project pathway (Figure 17)

Figure 17: EcoShare Program



Source: Groundworks

Emerging Legislation for a New Option:

The project masterplan build-out is predicated upon the anticipated adoption by the CPUC of a Community Solar Tariff, as discussed in the CSE Community Solar Program Viability Report (Appendix A). The project also evaluated a possible Community Choice Aggregation (CCA) regulatory environmental and, although the constructed DERs would be available to support a CCA in San Diego, current uncertainty and volatility around a San Diego CCA rendered this approach unfeasible at this time.

2.4.3 San Diego Unified School District Assets

Also located in the project area are seven schools, providing opportunity for the location of DER facilities, and as a role for the district as a customer in a new GTSR environment. Schools are among the most visible and biggest energy user in the *disadvantaged community*. These schools are and locations (Figures 18 and 19).

1. Gompers Preparatory Academy (1005 47th Street)
2. Millennial Tech Middle School (1110 Carolina Lane)
3. Chollas-Mead Elementary School (4525 Market Street)
4. Horton Elementary School (5050 Guymon Street)
5. Lincoln High School (4777 Imperial Avenue)
6. Porter Elementary School (4800 T Street)
7. Harley E. Knox Middle School

2.4.4 Public Safety

Conventional grid-based energy supply often experiences severe disruptions after disasters hit. There is a growing interest in using renewable energy options to improve community resiliency. During extreme weather events, solar can help prevent power outages by providing emergency energy to critical facilities and recovery efforts. Solar can provide electricity to remote or less accessible areas, and is flexible enough to be a mobile or temporary power source.

Communities are looking at solar as a viable option to achieve their goals for safety, security, and resilience. Integrating solar energy into your region can help prevent outages during extreme weather, protect critical facilities, provide energy in remote areas, and reduce energy security concerns. Developing Emergency Shelter solutions based on solar PV systems contributes to building an energy-resilient AEC community through secure and sustainable energy supply along with emergency sheltering for disaster victims in dire needs during disaster relief period.

When natural disasters occur and the conventional, grid-based energy supply is severely disrupted, the solar-powered emergency shelters are capable of being quickly deployed, providing displaced victims with the much-needed emergency shelters and a reasonable amount of energy from integrated solar energy systems (such as PV is integrated into the shelter's roof). From this perspective, low-carbon renewable measures (like solar) can be integrated into an overall energy-resilient and sustainable power infrastructure. For a post-disaster community facing relatively long-term recovery, this model could even be the basis for micro-grids to sustain community rehabilitation.

The result is innovative energy-resilient technology for natural disaster relief, which contributes to building a sustainable and energy-resilient AEC community.

Figure 18: Map of SDUSD Properties in the Project Area

Source: Groundworks

Figure 19: SDUSD Properties in the Project Area

2.5 Key Findings/Opportunities/Constraints

Key findings are depicted in Table 4.

Table 4: Key Findings, Opportunities and Constraints

Existing Conditions Topic	Takeaways
Physical Conditions	Sixty-two acres of undeveloped land with potential for generation and efficiency. Ideal location to transit, bay, working waterfront, downtown.
Socio Economic Conditions	Young, motivated population that is concerned about climate changes and interested in solutions. 6,000 students in Project Area offer energy education/training potential. Majority of residents are renters, requiring project-wide energy solutions rather than home-by-home solutions, which rely on landlord involvement.
Energy Consumption	Public School district is the largest energy consumer in Project Area, and represents a key and significant partner community renewable energy project as an “anchor” subscriber and property host to generation facilities.
Energy Generation/Efficiency	Older housing stock has embedded construction barriers for rooftop PV. Low commercial/residential PV penetration. Schools are potential energy generation site. Close landfill is potential energy generation site.
Regulatory Framework	The GTSR goal to bring green energy to all customers provides an initial consideration to support a community energy project for ZNE in low-income communities. CCA is not an option.
Other Energy Factors (water, transportation, waste)	Groundwork’s leadership role and successful funds development as Chollas Creek Watershed Manager with currently funded projects. Master Plan needs to align with City Climate Action and Public Utilities goals. There is low EV penetration and no EV infrastructure to support it.

CHAPTER 3:
AEC Visioning

Conceptual Framework

The vision for an AEC is based on the existing conditions analysis in Chapter 2 which addressed barriers and challenges posed, and available opportunities. This chapter proposes a vision, and describes options that were analyzed.

AEC Participatory Community

Introduction

As described in the Existing Conditions analysis, the project area's community members have a general desire to participate in programs and solutions to combat climate change issues. There are barriers and challenges, however, such as information and resource gaps that preclude community members from fully embracing AEC strategies. Future engagement is envisioned to be based on these principles:

- A careful and planned approach is necessary to engage the community in transitioning to ZNE.
- Institutional partnerships are essential.
- Student engagement can be effective, but should not involve household information residents perceive as sensitive.
- DACs require advocates in the regulatory arena if they want to take part in an AEC.

Recommendations

A multi-faceted approach to engage the community is envisioned together with any project-related efforts that result from the visioning process. This plan envisions that the Groundworks San Diego continue its community-based outreach and programming with the following six components.

Maximize Climate Action Education at EarthLab

By using EarthLab as a future community *Climate Action Center*, Groundworks San Diego can expand program participation, target new customer segments, or improve delivery mechanisms to include more of this area's low-income residents (and others). Community-based programs integrate grass-roots level elements like community targeting and local partnerships into traditional EE program models to overcome vexing barriers for greater adoption. Several reviews already demonstrate that such community-based energy efficiency programs can lead to significant savings.

Social Media Education

Incorporating the *Energy Tutorial Instagram Pledge Campaign* with sixth and seventh graders, the engagement efforts will encourage the youth to become Social Media Climate Ambassadors

with a mission of using "social media to bring awareness and make an impact on climate action in their community."

Another online strategy to gain their participation is an energy savings tutorial presented an animated journey through a typical home using conservation tips in each room.

School Education

Groundworks San Diego will use strategies to educate children at the schools in the community and closely coordinate with the SDUSD. The team will design the educational activities to help students understand how their behavior affects the environment and develop positive behaviors to be sustained over their lifetimes. It will also work with teachers to align climate action lesson plans with state standards to allow for education in the classroom.

Energy Workshops

It is recommended that energy workshops be offered to respond to community members' questions and concerns about solar generation, EE, and water conservation. At each workshop, staff from Increase Clean Energy, GRID Alternatives, UCSD, and Groundworks San Diego will discuss energy efficiency and generation options for the home.

Demonstration Homes

Groundworks San Diego recommends that demonstration homes be provided and available through open house events where community members could tour the home, see the upgrades, and ask questions. The open houses also provided an opportunity to motivate residents to take the energy pledge.

Energize a Block Canvassing

The outreach plan also includes a canvassing effort called *Energize a Block*. The Energize a Block canvassing will increase the pledges and the awareness of the "Energize Our Future" campaign to homeowners, renters and community members in the project area.

In addition to these six components, recommendations from the SB 350 Barriers study were emphasized and call for:

- Energy upgrade financing pilot programs to evaluate a variety of models to improve access and participation of low-income customers.
- Tariffed on-bill pilot for investments in energy efficiency that targets low-income customers regardless of credit score or renter status, and that do not pass on a debt obligation to the customer.
- A pilot program to provide low-income customers the option to use their California Alternative Rates for Energy (CARE) subsidy or other subsidies to purchase shares/subscriptions in a community solar offering with the goal to reduce energy bills by at least as much as the CARE discount.
- A credit enhancement pilot program to encourage financing for energy improvements for market-rate, low-income multifamily housing and commercial, community, and industrial buildings in disadvantaged communities.

- Evaluate the potential for social impact bonds to increase investment in energy upgrades for low-income customers.

Opportunities and Recommendations

If the Encanto area is to transform into an AEC, ultimately all community members must have to access clean energy pathways. These community energy pathways should:

- Lead to long-term nZNE outcomes
- Provide the project area's disadvantaged community residents access to renewable energy at affordable rates
- Create local, distributed energy generation

This section will describe the regulatory and policy frameworks within which community energy might be achieved. Chapter 4 will present project design and construction strategies of the proposed DERs.

In the Project's visioning process, relevant tariffs included:

- Net Energy Metering 2.0: This tariff allows solar customers to sell their excess solar energy back to the energy grid in exchange for credits from their local utility. Customers are only responsible for paying for the "net" difference in electricity bought and sold. This tariff relates to solar PV systems installed on homes and businesses.
- Virtual Net Metering (V-NEM): This tariff is available to multi-tenant properties that enables an owner of such property to allocate a solar system's benefits to tenants across multiple units. A microgrid, a small network of electricity users with a local source of energy that is usually attached to a centralized grid but able to function independently, can sometimes be supported by this tariff.
- Enhanced Community Renewable (ECR): Implemented under the GTSR, this program reflects the community solar model of renewable energy purchasing. The ECR tariff was the closest one to enabling the specific community energy project envisioned by the project team.
- Community Solar: This is a proposed tariff that would expand solar adoption on a community-scale specifically in disadvantaged communities and targeting low-income residents. The program will allow project site hosts, low-income residents in disadvantaged communities and non-low income disadvantaged community residents to split the net energy metering credits to ensure project financial viability.

Community Energy Solutions

A community energy solution is a pathway where project area residents can access clean energy without making a solar PV system purchase. Such an option is necessary in the project area if maximum resident participation is to be achieved. Project visioning addressed any existing

program options that would enable a community project to deliver access to the project area's members without investing in their own a renewable energy system, such as rooftop solar PV. Although many theoretical models have been suggested in California, there is only one regulatory program option currently available.

The analysis explored the existing option in the framework of the project's original goal to provide (in the aggregate) for a significant ZNE outcome for the entire community. Based on the project area's energy profile, the grant team determined that a renewable project generating about 2-4 MW of electricity would offset the collective consumption within the disadvantaged community. To meet that goal, the project planned to install two projects to produce more than 7.7 million kW of renewable energy.

EcoShare Program

Background

EcoShare is the SDG&E enhanced community renewable program implemented under the GTSR scheme. GTSR has two components, the Green Tariff and the ECR Tariff. Groundworks San Diego focused on the latter. EcoShare is an ECR-based program and the only program available to conceive a project that would generate energy to meet ZNE demands of the project area on a community-wide scale.

The starting point for the Project was to evaluate how to deliver an EcoShare solution. As introduced in Chapter 2, EcoShare's program components are:

- A 3rd-party developer enters into a PPA with SDG&E to sell locally generated, renewable energy to SDG&E.
- The developer signs up subscribers to purchase a share of the energy generated.
- Subscribers received a credit on their SDG&E bill reflecting the amount of energy they have purchased from the project.
- Subscribers pay a subscription amount to the developer.

No project has been developed according to any IOU's (SB43) ECR program. As such, the project's planning process revolved around discovering a way to deliver this community solution in a way that was viable, sustainable and implementable. In the planning process, analysis focused on developing a project that would deliver "affordable" renewable energy access for community members. This focus was tailored to be consistent with mission of the Project Lead to provide its community members with:

- Access to renewable energy for project area residents at an affordable rate.
- Energy costs lower than existing SDG&E rates, including CARE rates.
- Re-direction of profits from the ongoing operations of the project into programs and activities that support local educational and community programs.

To retain flexibility for project generation options, the project team initially studied multiple DER technologies. Ultimately, the analysis focused on a combination of fuel cell and solar PV and also a 100% solar model. The former would provide a DER mix that would optimize available property space and the latter presented the cheaper solar generation costs. Project specifications considered were:

- 2200 kW of Solar PV (about 3.6 million kW of energy). In San Diego, the solar production is approximately five hours per day averaged over the year.
- A 500 kW Fuel cell system that would produce about 4.2 million kW of energy.

Potential Sites

The location of each proposed DER would help determine its feasibility. Given the shortage of developable land in this older, built-out, urban project area, site identification was a challenge. School district properties and commercial lots surfaced early on as the likely site locations. All sites considered were located in the project area disadvantaged community or in an adjacent environmental justice neighborhood, as identified by SDG&E.

In particular, SDUSD sites are attractive:

- *Cost Control:* Site control costs could be minimized, contributing to a stronger pro forma.
- *Subscription Commitment:* SDUSD commitment to subscribe to at least 50% of the total project renewable energy output could contribute to project feasibility.
- *Minimum Subscriber Requirement:* Program guidelines provide that minimum subscriber requirements can be waived if a public or municipal agency is involved in the project. Accordingly, if the project could be located at a SDUSD site, and the school district became an EcoShare subscriber, initial program hurdles could be cleared.
- *ZNE Schools:* Locating a project on a school site and providing energy to the school for its own use (under a program which would allow both the schools and community members to access the output) could help advance SDUSD's ZNE policy.

Among school district sites in the project area, three were examined as possible host sites for generation facilities. The first was EarthLab, the property operated by Groundworks san Diego and is part of the Millennial Tech Middle School campus. A second site was Gompers Preparatory Academy, a charter school that leases its campus from the school district. The third site was Chollas-Mead Elementary, an elementary site that was designated by SDUSD for solar PV installation work.

To generate 2-4 MW of output, in addition to the desired 2.2 MW of solar, a 500 kW fuel cell was proposed at all school locations to meet the energy load requirements. Including a fuel cell, however, required evaluating a renewable fuel source for the fuel cell, to qualify the generation as a renewable source.

Biogas Generation for the Project's Fuel Cell - Waste Biodigester

As the community renewable energy project was developed and refined, the inclusion of a fuel cell element necessitated the exploration of a source of fuel for the DER technology. Biogas, particularly anaerobic digester gas, has one of the most important alternate fuels to be considered in the product mix. Using biogas to produce electricity or usable heat is considered carbon neutral as the carbon released is from a non-fossil source and was sequestered in the growing of the organics that comprise the biomass.

The project team began conversations with the City of San Diego regarding its closed-landfill, Chollas Landfill, to investigate locating a biodigester at the site. It would be fed with processed food waste from the city to create bio-methane gas. Converting this waste into a biogas pure enough to inject into the gas pipeline (directed biogas) is expensive. Because of this cost, the planning process explored on-site electricity generation using microturbines at the landfill site. These would be fed with the bio-methane yielded from the bio-digester after the requisite purification. The planning analysis assumed that this scheme would be more economical than transporting biogas to the fuel cell site. Because integrating a fuel cell in the DER mix only exacerbated the weak performance of critical project factors, this tie-in to a landfill project was later discontinued in the feasibility analysis.

Analysis of Project Feasibility Study/Business Case

An assessment process determined whether a community renewable project, developed by the Groundwork San Diego and according to EcoShare, could operate with no grant money by attracting private investment. The goal would be to generate renewable energy at cost-effective levels and offer access to this clean energy to EcoShare subscribers at subscription rates. When combined with the EcoShare credit amount, this project concept would lead to no net increases in energy costs or potentially a savings in total amounts dedicated to energy payments.

Initially, a preliminary evaluation was conducted to determine if a project under the enhanced community renewable (ECR) tariff used by EcoShare could be financially sustainable. Project team members created an economic analysis model with key ratios and metrics to address. This evaluation reviewed:

- Cost of proposed solar PV generation based on industry standards for solar generation.
- Cost of proposed fuel cell generation as provided in actual quotes by fuel cell manufacturers.
- Cost analysis of infrastructure, land and equipment expenses.
- Operations and maintenance expenses.
- Projected administrative and overhead costs.
- EcoShare credit that would be provided to project subscribers.

The general finding from this analysis is the EcoShare Program has a number of shortcomings, which effectively restrict the ability of a developer to model a commercially viable project. Among the program weaknesses or challenges are:

- Local generation and distribution not valued.
- Lack of flexibility for the developer to manage the customer subscription process.
- Complex customer acquisition rules.
- Marketing challenges for a non-traditional developer.
- Project financing expenses.

The program feasibility study is included in this master plan (Appendix B-3a). Based on limited input and factors, this preliminary study concluded that, while it might be possible to build a business case that could support a sustainable business enterprise, in the current stages, the EcoShare program does not support a commercially viable project. But, consistent with the initial study, a more thorough and traditional business case review was required before the commercial viability of the project could be fully determined.

The Business Case studied:

- Developing a working financial model (proforma) per traditional and usual business and industry frameworks and formats.
- Anticipating performance within a given set of assumptions
    - Equity/debt ratio
    - Cash flow
    - Net operating margins
    - Internal Rate of Return
- Identifying the business/financial issues associated with the business case.

The project business case review and model is included in this report's appendix (Appendix B-3a). The Business Case confirmed the general finding of the program analysis; more explicitly it focused and addressed the ultimate commercial viability issue.

The Study/Business Case fully reviews the viability of this project. But for the moment, it is important to note the following critical success factors (CSFs):

1. The proposed project should conform with accounting rules (US generally accepted accounting principles") and industry best practices to ensure calculations are robust and reflect realistic scenarios.
2. Returns that make the project and program scenarios attractive to at least impact investors, which means internal rate of return in the mid-teens or above (unlevered, at least 14% to 16%).
3. A community solution without the benefit of CCA, which means evaluating if the solution will be preferred by and sustainable for low-income/disadvantaged rate-payers (by a non-profit or for-profit entity that is not a government agency). After covering the

cost of capital, this requires adequate cash reserves for a healthy, functional and well-run CBO-nonprofit as the sponsoring organization.

Given such CSFs, the study concludes within the parameters of this project with no underestimated revenue streams or excessive costs that this project would not be financially feasible. It does not perform well enough to be considered viable without either substantially lowering costs or increasing net operating margins, or both. In short, this project:

- Does not yield enough revenue and profit margins to sustain the enterprise for the developer. Project forecasts show low, five-figure annual savings for participating schools.
- Does not provide enough cost savings to the SDUSD to support its participation under this business model.
- Does not offer sufficient market opportunity as subscribers must opt-in and are subject to an exit fee, which discourages participation.
- Is structured such that demand response customers, like SDUSD, only see a reduction in the commodity price of electricity; nothing in the program lowers the demand charge portion of their bill.
- Does not fully value the energy credit, nor is that credit provided directly to the developer which would allow the developer to maximize revenue while still allocating credit and benefit to subscribers to yield significant energy costs savings.

The study was repeated with 4,000 kW solar PV as the renewable energy generation for the community and no fuel cell, and the results did not change much and the conclusions remain the same.

Community Solar

Background

After an exhaustive analysis proved that no financially viable scenario for a community energy project according to EcoShare exists, the project shifted to completing the master plan under a community solar" tariff. A community solar tariff, an alternate to the existing virtual net metering (V-NEM) tariffs, would provide that non-contiguous, non-related meters could receive the benefit and credit of locally generated renewable energy. While the existing V-NEM tariff enables a single owner with multi-metered properties or properties adjacent to one another to participate in NEM programs, the community version could extend to multiple neighborhoods within a territory, allowing multiple owners to access renewable energy.

The project team opines that community solar has the potential to bridge the gap between rooftop solar and green tariff programs, and provide solar access to customers who may have limiting circumstances such as renting their unit, having an unwilling property owner, or site factors not ideal for solar. While no developer has created a community solar project under the rules currently in place in California, programs have flourished in other parts of the county.

California has an opportunity to build on this success. The project area's AEC could be a starting point.

The present proposals being considered in the CPUC rulemaking preceding all address and improve upon the EcoShare program challenges in one way or another. Given the March 2018 decisions issued in the relevant CPUC rulemaking proceeding, it is anticipated that a Community Solar tariff will be adopted in 2018 and will be conducive and favorable toward a commercially viable community energy project.

With the likely scenario of a community solar tariff being approved later in this year, the planning process analyzed the same proposed community energy project as was evaluated in the EcoShare scenario. In other words, the same project concept was assessed with the same project elements, but with different program parameters.

A community solar program study was developed and is included in this report's appendix (Appendix B-3b). In it, the following was specifically evaluated:

- Technical and regulatory requirements associated with virtual net energy metering (V-NEM), as pertaining to the project
- Technical and regulatory requirements of anticipated, expanded VNEM design models (community solar), such as those currently outlined in R.14-07002
- A quantitative and qualitative comparison of existing and proposed models as applicable to the project

CSE performed an assessment on the potential for community solar within the project area's AEC using the ideal program structure itemized above. This community solar study identified the optimal design to meet the community energy objectives. Moreover, a financial analysis was performed. In addition, this study also recommended additional tariff elements to foster viability of a community project.

Finding

As found in the CSE study, project financials may not be as attractive to for-profit entities that typically have more aggressive investment criteria. From their analysis, a payback of about 13 to 15 years is likely under current available mechanisms. For-profit entities that have aggressive return on investment (ROI) and cash flow projections may not be good candidates to develop a project where the participating stakeholders have thinner margins and less ability to accept financial terms that fall outside the parameters the team determined through the analysis. A better fit, however, could be non-profit, community-based organizations. An organization like the project lead, a CBO with the financial ability, would not have as tight of financial parameters around ROI and payback. Rather, the CBO would, as benefitting its nonprofit, community mission, be patient and wait longer for its return in exchange for more value passed on to participating customers within its community.

A community solar program, as currently being considered by the CPUC, could move a project's performance into the range of adequate operating margins and returns on invested capital.

Project "Expansion" – A Conversion Pathway

As previously described, as the only program pathway – EcoShare – does not allow a commercially viable, community energy project, the project team developed another scenario. Under this sequence, it could be possible to construct projects and stage them so that when a community solar program/tariff is adopted, each could be expanded into serving residents of the project area.

As presented in Chapter 4, the shovel-ready, projects proposed immediately support and assist SDUSD achieve progress toward its own ZNE policy for schools in the project area. These are the EarthLab-MTM and Gompers projects.

In Stage 1, when the projects generate green energy for the schools, there are significant benefits proposed for each of the campuses. At this stage, the projects support and advance SDUSD's ZNE goals.

In Stage 2, which occurs upon regulatory change, such as the CPUC adoption of a community solar program, these proposed projects can be "expanded" into community solar projects. Under such a program, project area's members will benefit by accessing the green energy generated. By allowing the proposed solar PV projects to provide benefit to community members, this stage essentially resolves the EcoShare problems and forges a viable pathway for a community energy project.

By staging the projects accordingly, the project team presented the Energy Commission with the opportunity to help accelerate using the first community solar projects in California. When the projects launched, the commercial viability of such projects in a disadvantaged community will be demonstrated. By proving the business proposition and value of the disadvantaged community-based projects, the project team believes it can show the private capital market that similar projects are worthy of 100% private financing.

Additionally, over time, these individual systems will be networked to provide more interoperability such as demand response. Using cloud-based software and electronic meter readings, these systems will be able to monitor the community generation and consumption and optimize the energy flows to create better ZNE outcomes. Given a forecasted project period of 10 years, more individual systems of the kind described above along with more networking for optimization at the community level is reasonably expected.

Community Choice Aggregation

It was also important to consider whether a community energy solution was feasible with a community choice aggregate (CCA) option. In a CCA, local entities aggregate the buying power of individual customers within a defined jurisdiction to secure alternative energy supply contracts. In theory, CCAs are able to create large contracts with generators by aggregating purchase power, something individual buyers may be unable to do. The main goal of CCAs has been to allow consumers greater control of their energy mix by offering "greener" generation portfolios than local utilities. Once established, CCAs become the default service provider for the power mix delivered to customers. In a CCA service territory, the incumbent utility

continues to own and maintain the transmission and distribution infrastructure, metering, and billing.

In California, the CCA is a model that has allowed communities to join together to purchase electricity on behalf of their community members. Given the relatively limited track record of CCAs, while greener portfolios are indeed offered, usually a “premium” is paid by the customer to access 100% renewable energy. The track record of delivering savings on customers’ electric bills is mixed.

Locally, a CCA scenario has picked up momentum. In summer of 2017, the city released a peer-reviewed study that found the program could offer more renewable energy and lower rates than SDG&E. At the end of the year, the city announced it would hire a consultant to develop a CCA business plan. In response, SDG&E submitted a proposal to city officials that allows an increase in renewable energy content over time to reach 100% renewable for program participants. In early 2018, the city indicated it would also conduct an outside review of SDG&E's proposal to determine if it is viable. But a CCA program will still require final approval from the city Council and that timeline is unknown.

Because there are no specific deadlines or even timelines for local legislative adoption, a CCA is not viable for this master plan. Given its unknown timeline for adoption the project team determined CCA was too speculative for significant analysis within this planning process and did not align with the EPIC grant timelines.

Of the CCAs in operation in California, no model in particular has a specific program that targets disadvantaged community and provides access to renewable energy at less than premium rates for low-income households. As such should a CCA emerge in the City of San Diego, an opportunity exists to work with the entity to develop a program model with the principal focus being the delivery of affordable clean energy to the project area. The pilot model would incorporate the base parameters that embrace a community solar scenario.

Recommendation

EcoShare does not support or allow a commercially viable, community energy project. The Business Case prepared for the project team reveals the weaknesses and gaps in project performance factors. But enough was learned to guide and instruct how a community project could prosper under a proposed, new community solar program. The project team has outlined an approach that takes advantage of the project feasibility and business case evaluation to define a pathway for a viable community energy solution.

It is recommended that a phased-in approach, starting with DERs constructed for local schools, be designed and constructed with excess generation capacity. In this scenario, project partners would continue to receive significant value per the projects and at a later stage, community residents could participate and receive value cost savings. As such, this master plan offers a solution to proceed with a community renewable energy project that is commercially viable.

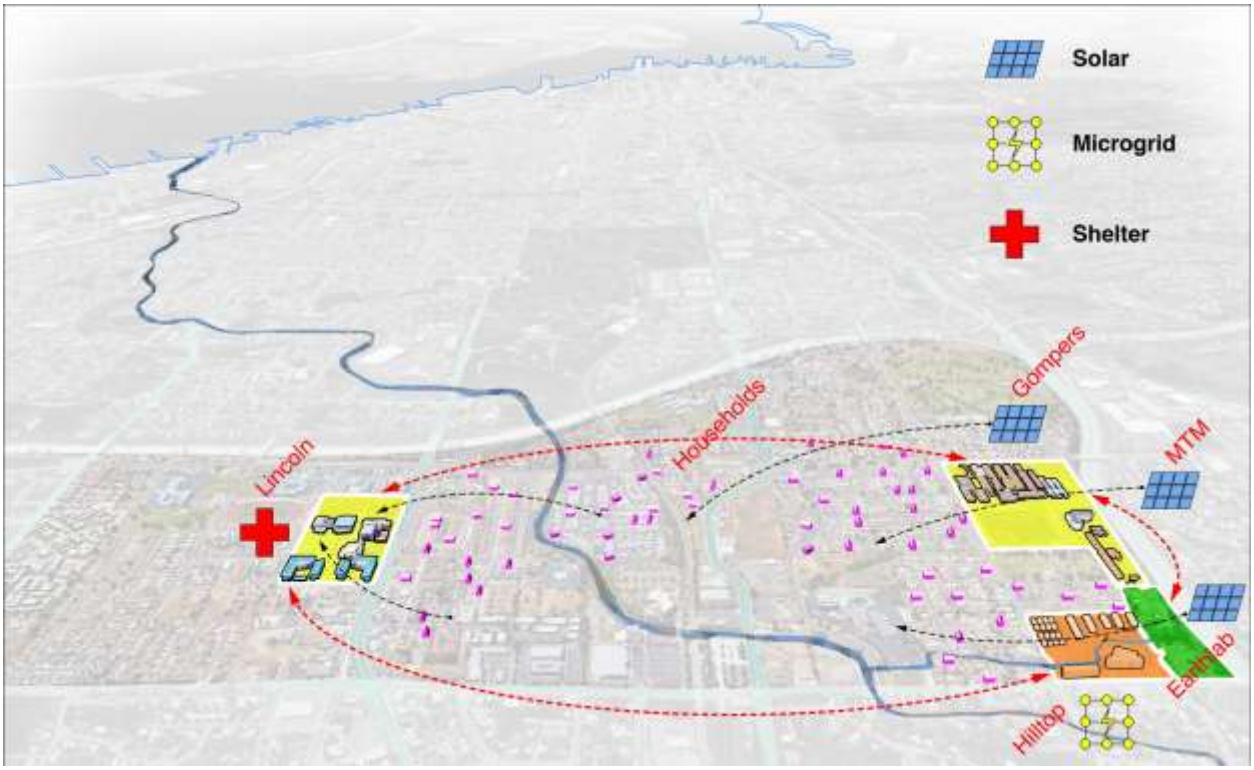
Summary and Conclusions

The project area's physical and socio-economic conditions set the parameters to consider, evaluate and propose an AEC vision. Strategies and projects must involve and engage the project area's residents. Community participation, predicated on a new, social-media based outreach and engagement, can be delivered by a trusted CBO.

Engagement and outreach, however, only provide for participation. An AEC must also offer options and resources. The project team has highlighted pathways for community stakeholders that lead to accessing clean energy. Homeowners and business owners can install solar PV systems with more information and choices on acquiring and financing.

The project AEC vision is completed with model projects that bring about greater energy security and resiliency to support an EcoVillage emergency shelter and, also, demonstrate how the AEC will handle and provide for future development in the community. Chollas EcoVillage AEC is the culmination of visioning, strategies and projects coming together, setting a platform of engaged, participating residents, proving pathways to access DERs that generate clean energy, and offering benefits of new technologies which are, ultimately, all joined or "federated" together. Figure 20 illustrates this holistic AEC vision.

Figure 20: Chollas EcoVillage AEC Vision



Source: Groundwork San Diego/UCSD

CHAPTER 4:
Master Community Design Plan

Introduction

The master community design plan (masterplan) is guided by the existing conditions, regulatory analysis, modeling and visioning outcomes of the project. It represents a federated system of DERs to create an AEC. Each of these DERs will address the needs of the disadvantaged community, and move the community towards nZNE. The following DERs are being recommended for Phase II funding. The institutional and microgrid DERs have been designed and prepared for construction; the commercial shopping center (plus charging stations) construction drawings/permit pathways will be completed subsequent to Phase I completion and prior to Phase II application.

The concept for the project as an AEC is to offer pathways and technologies which together bring the access and benefits of clean energy, affordability and access. The various pathways provide opportunities for the project area's residents to access renewable energy and to reach ZNE outcomes. The intersection of the pathways and projects is the federation of AEC strategies and systems.

This section lays out shovel-ready projects that can advance when California energy regulatory conditions change. Upon regulatory change, these proposed projects will demonstrate the commercial viability of community solar in a disadvantaged community. By proving the business proposition and value of the disadvantaged community-based projects, the project team believes it can show the private capital market that similar projects are worthy of 100% private financing.

The Phase I shovel-ready projects immediately serve and benefit key stakeholders in the project area AEC. Attached and incorporated into this master plan analysis are conceptual design plans (Appendix C-4a) and engineering design (Appendix C-4b) for the projects being proposed. The design plans show the energy technologies proposed and indicate the types of alternative energy generation systems to be located at each site. The generation systems consist of renewable PV generation working in concert with battery storage systems, tailored to the energy profile of each site. Completed single line diagrams for each site are provided with electrical ratings for individual components and overall system capacities, indicating point(s) of interconnection to the utility grid, and providing sizes and ratings for all balance-of-system (BOS) equipment and electrical feeders. The design plans also include site plans showing the location and physical arrangement of each energy system and their relationship to existing site elements.

The CPUC recently issued a Proposed Decision and an Alternate Proposed Decision, regarding the adoption of a tariff that would address particular barriers and challenges to increase renewable energy in disadvantaged communities. In the Alternate Proposed Decision, CPUC Commissioner Guzman-Aceves called for a community solar program. That program would

allow the proposed installations to move from Phase I to a Phase II Community Solar project. At that time, according to the new community solar program, energy generation could be allocated to project area residents.

Construction of these projects, and community solar tariff approval, will result in the first disadvantaged community-based community solar project in California. Because these projects do attract and meet the requirements of disadvantaged community residents in a commercially viable manner, any future projects proposed by the project team can attract 100% private capital investment.

Residential and Business DERs

The project team's AEC vision and strategies include a pathway for individuals to participate and access clean energy on their own. Because individual DER systems, most notably rooftop solar, are a key element of an AEC and a ZNE strategy, the project explored rooftop solar conditions in the project area, including:

- Barriers related to fuller rooftop Solar PV system adoption within this disadvantaged community.
- Pathways for expanding homeowners and businesses access to clean energy opportunities.
- Recommendations for single-family dwelling units.

Single Family Dwelling Units

The existing conditions presented in Chapter 2 confirmed many of the economic barriers restricting access to clean energy for disadvantaged community members: low home ownership rates; insufficient access to capital; and limited budgets with restricted opportunities to take on additional debt. CARE homeowners face other challenges too; their limited disposable funds mean they may be more risk-averse and less capable of participating in programs with high upfront payments or copayments. At the same time, poor credit or lack of collateral may restrict access to financing options. Older buildings are more likely to have structural or design issues that make energy efficiency and renewable energy retrofits unviable, particularly for people in disadvantaged communities, who are more likely to live in such housing.

Working with two solar partners (Grid Alternatives for the lowest income residents and Increase Clean Energy for residents willing to consider traditional or Property Assessed Clean Energy financing), the project area's homeowners were approached with two opportunities. One opportunity was for grant-funded water conservation upgrades (rain barrels, greywater systems, drought tolerant landscapes). With it, a second offer of solar installation consultations was made. For non-grid eligible homeowners, an energy audit was performed by our commercial solar partner. Numerous residents availed themselves of public, PACE, and traditional finance options to improve efficiency and install solar.

Businesses

The project team's efforts revolved around addressing commercial entities' inability to access traditional financing mechanisms to support access to clean energy. Local small businesses face financial obstacles related to business cost structure, self-financing requirements, and insufficient access to private funding. While the residential outreach was occurring, commercial outreach was also underway. In June 2017, BlueFlame created offer letters for 25 of the project area's commercial customers to advance PACE financed solar PPA's. These offers were based on the current SDG&E commercial rate structures and proprietary software used to create the offer letters. Owners of these identified businesses and commercial buildings were contacted via email and by phone.

Once a potential commercial business owner was contacted, a face-to-face meeting was set up to present the goal of the master planning effort, the particulars of the BlueFlame offer letter, and the steps necessary to move forward. Because energy efficiency was a central component of each commercial site visit, the Blue Flame commercial team conducted an energy audit to identify what energy efficiency measures could be taken to reduce the overall load of the building before installation of the PV system.

Commercial clients expressed a strong interest in energy bill savings, which was expected, and also an equally strong commitment to improving the environment and adding value to climate action initiatives. Although a number of projects are pending, the following barriers to the outreach effort were discovered:

- Property owner concerns about the relationship of PACE financing to future property tax and property sale considerations.
- The need to offer traditional as well as PACE financing.
- Difficulty identifying and engaging property owners.

Despite these challenges, outreach to top commercial entities in the project area remains a high priority. Commercial participation is a significant factor in ZNE generation planning, as it relates to the overall energy consumption of the project area and to community energy generation goals.

Recommendation

To provide opportunities and pathways for individual homeowners and businesses to access renewable energy at greater rates, the project team supports already-promulgated recommendations and suggestions. Those include aligning low-income program with the latest market trends and industry best practices. Clean energy finance professionals, information technology experts, and other marketplace actors with proven expertise should be sought to help design and implement effective financial, housing, and energy service programs.

The project area could certainly benefit from the adoption of a disadvantaged community-single-family affordable solar housing (SASH) program currently being considered by the CPUC. That program will provide up-front financial incentives for solar installation on homes owned by low-income residents in disadvantaged communities. The program would allow for greater eligibility and help overcome barriers like lack of access to capital or credit. The disadvantaged community-SASH program will provide $10 million in incentives annually through 2030, funded by utility greenhouse gas allowance revenues or public purpose program funds.

Other State programs can align and compliment this focus. For example, California should consider enhancing the priority of affordable housing tax credits for housing rehabilitation projects to include onsite energy efficiency and renewable energy upgrades. In addition, a pilot for one-stop shops would provide technical assistance and funding services to enable owners and businesses in disadvantaged communities across California to install clean energy systems (and water-efficient upgrades) in their structures. At these one-step shops, information should be provided in a variety of languages and in a format relevant to local low-income communities.

Institutional DERs

San Diego Unified School District (SDUSD)

SDUSD is the largest energy customer in the project area. There are seven public schools in the disadvantaged community, including Lincoln High School, the largest energy consumer in the district and within the community. SDUSD has a track record of leading programs for reducing energy and water use, increasing recycling levels, developing solar energy partnerships, creating educational resources, and supporting green initiatives.

The project team's goal was to leverage these initiatives and efforts and assist SDUSD in realizing ZNE outcomes as well as partner with the school district to develop facilities that could serve as generation sites within the community solar tariff for the benefit of and access by Chollas EcoVillage residents.

SDUSD has a comprehensive plan to install PV solar generation and energy efficiency measures to reduce consumption and purchase of grid power from the local utility, while improving the environment for the students and local community. The resources installed at SDSUD schools in the project area are being funded through a variety funding programs including Proposition 39, and will move the community towards ZNE.

The District's Proposition 39 team was crucial in identifying local schools already engaged in District projects ranging from monitoring and controlling energy use to solar PV energy generation. By working with SDUSD, the project team developed a strategy for local schools that not complements its energy program management efforts, but also provides the platform to start community solar projects. The project team proposes to partner with local schools and use a new approach. Solar installations are suggested for two sites:

- Millennial Tech Middle School
- Gompers, a charter school adjacent to Millennial Tech Middle School

Financial modeling forecasts significant revenue streams for the district in return for use of the schools for generation under the anticipated community solar tariff. In this approach, Groundwork would provide a revenue stream to the school district in return for control of the sites for the purpose of entering into negotiations with the commercial developer produce community solar energy.

EarthLab at Millennial Tech Middle School

EarthLab is a four acre open-air, environmental classroom under the management of Groundwork through a 40-year license agreement with the property owner, SDUSD (Table 5). The site sits on the eastside of the Millennial Tech Middle School campus (Figure 21). Groundwork collaborates with UCSD and the SDUSD to provide high quality environmental and STEM education to thousands of at risk-youth each year. As an emerging center for conservation education for area families, the project team envisions EarthLab as a hub for environmental education and climate action, as well as a location for new advanced energy infrastructure.

The project team proposes about a 577kW solar PV system at EarthLab with a corresponding battery storage system. Phase 1 of the project will provide renewable energy to MTM to help the school move toward ZNE. Up to the full generation capacity, depending on the ultimate agreement with SDUSD, can be available to the school. The storage system will be located on the immediate MTM campus. During Phase 2, after a community solar tariff is adopted, 50% of the generation will be made available to eligible project area residents. If the program's tariff dictates different terms, the generation amounts available for distribution will be adjusted accordingly.

Table 5: EarthLab – Millennial Tech Middle

Design	Solar PV Shade structure (at EarthLab) w/ Battery Storage (at MTM)
Purpose	Help Chollas EcoVillage schools achieve ZNE & generate for future community energy program
Site	Eastside of MTM campus 1110 Carolina Ln., San Diego, 92102
Generation Capacity	577kW
Energy Storage	57 kW/162 kW
Beneficiary	Millennial Tech Middle School
Cost	$109,250 (Incl. SGIP) for storage + $2,308,000 for PV System
Future Community Generation	288 kW

Source: Groundworks San Diego

Figure 21: Aerial View: EarthLab – MTM PV Project

Credit: RevSolar

4.3.3 Gompers Preparatory Academy

Gompers Preparatory Academy (Gompers) is a charter secondary school located on SDUSD property and operated in partnership with UCSD (Figure 22). The master plan includes a proposal to construct an 886kW solar PV system with a corresponding battery storage system (Table 6). The first stage of the project will provide renewable energy to Gompers to help it progress toward ZNE. At Phase 1, up to the full generation capacity can be made available to benefit the school. The storage system will be located on the immediate Gompers campus. During the Phase 2, 50% of the generation will be made available to eligible project area residents.

Figure 22: Aerial View: Gompers Project

Credit: RevSolar

Table 6: Project Summary: Gompers

Design	Campus Solar PV Carports w/ Battery Storage
Purpose	Help Chollas EcoVillage schools achieve ZNE & generate for future community energy program
Site	Gompers Campus 1005 47th St., San Diego, 92102
Generation Capacity	886 kW
Energy Storage	57 kW/162 kW
Beneficiary	Gompers Preparatory Academy
Cost	$109,250 (Incl. SGIP) for storage + $2,866,500 for the PV System
Future Community Generation	442 kW

Source: Groundworks San Diego

Chollas EcoVillage Emergency Shelter

In Phase II, storage will be constructed at Lincoln High School, supported by existing solar. It will allow a proposed agreement between the Red Cross and SDUSD through which the Red Cross will operate an emergency shelter for the disadvantaged community. Under this agreement, the Red Cross is responsible for powering the shelter and compensating the District for any energy used during its operation. Maintaining operations and providing resiliency for powering the shelter are crucial goals for the disadvantaged community. The team developed a model to support the shelter with electric power so it would be able to operate in parallel with the utility grid, as well as independently from it during a broad-scale energy outage. This independent functionality will ensure that the shelter can continue to provide critical services through a long-term outage event.

Lincoln High School's role as a shelter within the project area is also key as a model to communities across the state because disadvantaged communities and their low-income residents often suffer disproportionately from disasters. Many low-income families live in areas prone to natural disasters, such as floodplains, because this is where land is typically cheaper. They also often lack adequate resources to prepare for and recover from disasters, such as having the funds to board up their house, a car to evacuate, or a place to stay if they must leave their home. With fewer assets, little insurance, and less diversified income sources, families that are already struggling can be pushed into destitution when disaster strikes. Moreover, low-income residents are often more vulnerable to natural disasters because:

- The limited access of low-income individuals and families to financial resources may reduce the likelihood of material preparedness. Simply, families struggling to make ends meet are less likely to store resources for a "rainy day."
- Low-income individuals are less likely to own health or disaster insurance or qualify for a loan to rebuild during recovery.

California law sets the responsibility for emergency care and shelter at the local level. Local government is to provide or contract with recognized community organizations to make emergency or temporary shelter available for people made homeless by a natural disaster or other emergency. For these reasons, the planning process investigated the opportunity to enhance Lincoln High School with a microgrid.

Under the agreement between the Red Cross and SDUSD, the Red Cross will operate the shelter, compensating the District for any energy used during its operation. Maintaining operations and providing resiliency for powering the shelter are crucial goals for the disadvantaged community. As such, the planning process developed a model to support the shelter with electric power, so it would be able to operate in parallel with the utility grid, as well as independently from it during a broad-scale utility outage. This independent functionality will ensure that the shelter will be able to continue to provide critical services through a long-term outage event.

The project team proposes to support the community-designated, Red Cross emergency shelter at Lincoln High, and help make it an energy-secure, independent facility that can maintain operations during community crisis (Table 7) (Figure 23). This particular project is not designed to participate in a Community Solar Program. The project has two components:

1. Battery storage plus 200kw solar PV system will support the school progress toward ZNE goals and, more importantly, keep separate and independent the school load from the emergency center load.
2. A battery storage system which specifically will support the Red Cross Center's critical loads and the school load.

Table 7: Chollas EcoVillage Emergency Shelter

Design	200kW solar PV system to support the Lincoln High School energy load and energy storage supporting the Red Cross Emergency Center critical loads
Purpose	To ensure the community-designated, Red Cross Emergency Shelter is energy-secure during operation and, in cases of severe crisis, be "islandable" for maintaining critical operations.
Site	Lincoln High School 4777 Imperial Avenue, San Diego, CA 92113
Generation Capacity	200 kW solar PV system (Lincoln High School)
Energy Storage	142.5 kW/405 kW
Beneficiary	Chollas EcoVillage community
Cost	$ 292,539 (including SGIP) for storage; solar PV system funded by Prop 39
Future Community Generation	None

Source: Groundworks San Diego

Figure 23: Aerial View of Chollas EcoVillage Emergency Shelter

Source: Groundworks San Diego

Microgrid DERs

Even in older, built-out disadvantaged community landscapes, neighborhoods continue to change with new development and redevelopment. New neighborhood projects provide opportunities to demonstrate advanced energy models that serve and supply these residents with renewable energy and bring innovative solutions to new development occurring within the boundaries of the AEC. The project proposes a community-centric renewable power generation and energy storage system with intelligent microgrid controls (Table 8). It will leverage existing rooftops, carports or other appropriate spaces to locate the PV and will feed all energy produced to the interconnected residents and businesses. In addition, the energy generated by the PV system will feed the energy storage system, which will be used to reduce the characteristic late afternoon demand ramp and to reduce cost and reliance on the utility. It is envisioned that the entire community would be metered at one point of connection and that the community would have the ability to island and maintain critical loads in the event of grid outages.

Table 8: Microgrid for New Development

Design	Community Microgrid: Community PV + Community Energy Storage
Purpose	Community scale microgrid designed to meet ZNE and contribute to Chollas EcoVillage federated ZNE portfolio
Site	Corner of Euclid and Hilltop bordering south edge of Hwy 94
Generation Capacity	500 kW
Energy Storage	200 kW/1600 kW

Beneficiary	Hilltop & Euclid mixed-use development and its commercial/residential members
Cost	$2,000,000
Future Community Generation	None

Source: Groundworks San Diego

A highly regarded affordable housing developer has been approved by the City of San Diego to begin a proposed development this project area.

The development at Hilltop and Euclid will be a mixed-use project including:

- Market rate single-family for-sale homes.
- 84 affordable apartments for families who earn 50%-60% of the area median income.
- 8,300 square feet of retail space.
- A park that can be used for local events.

Members of the Hilltop development team have agreed to partner on a microgrid demonstration project to showcase an "EcoBlock" model that supports this going green project and reaching nZNE outcomes. This microgrid consists of four general elements (Figure 24):

- Self-generation (like solar).
- Energy storage.
- Self-islanding modes.
- An intelligent micro-grid controller.

Figure 24: Generic Micro-Grid

Source: Groundworks San Diego

For the Hilltop & Euclid's EcoBlock concept, a microgrid can potentially be used for all of its commercial, multi-family housing, and single-family project elements. Microgrids have been successfully used in many different settings but perhaps not in such a comprehensive manner.

Based on early project parameters, the expected commercial loads the community will likely consume are 500,000 to 600,000 kW per year. The anticipated demand from this community could be in the range of 170 kW-230 kW. To generate about the equivalent energy consumed by this community a 350-375 kW solar system would need to be installed which is enough solar to achieve ZNE. The energy storage system size will depend on a number of factors but if it is expected to serve some portion of the load for the entire five hour on-peak period so the battery would require at least that amount of energy capacity or in the range of 850kW to 1,150 kW.

At this stage in development, it is assumed that there is not more than one utility connection for the whole community. The utility connection will serve as one of the redundant power sources for the community but in a limited role. The flow of power from the utility to the microgrid will occur only under circumstances that the system is not generating enough energy to cover the demands of the community. There will always be connection to the utility so if the batteries are depleted, then the system can default to consuming energy from the grid. This back-and-forth between the grid, the home batteries, and the solar and the larger shared resources is automatically coordinated by a smart energy operating system, such as microgrid controller.

A V-NEM tariff is available to multi-tenant properties to allow property owner to allocate a solar system's benefits to tenants across multiple units. Tariff rules allow the system owner to allocate renewable generation bill credits between common load areas and tenants along a single service or multiple service delivery points. Otherwise the bill credits function the same as the NEM program. It was first piloted under the California Solar Initiative Multi-Family Affordable Solar Housing Program to provide equal and direct benefits of the solar system to low-income tenants in an affordable housing complex. The CPUC authorized the expanding the V-NEM to the general multi-tenant market in Decision (D.)11-07-031.

SDG&E's program tariffs include V-NEM for multiple meters at the same location to share the generation from a solar system. This program is for residential and commercial customers. The meters do not need to be in the same customer name.

A report detailing feasibility of the microgrid model for new residential and mixed-use development in project area is found in Appendix B-3c. Energy consumers are passive electric energy users who lack precise control and flexibility over how, when, and what resources they use to power their homes and businesses. This lack of control leaves the passive consumer exposed to expensive energy and high electric bills compounded by year-over-year electric rate escalations. Cyber security threats and grid outages caused by natural disasters and aging electric infrastructure only exacerbate this problem.

Intelligently managed microgrids however, offer clarity, control, and surety for communities powered predominantly by DERs like solar and energy storage. Intelligent energy technology, controls and software enables residential, commercial or mixed-use communities to meet their objectives for utility cost savings, greenhouse gas reductions, and energy security by reducing reliance on the conventional utility and actively managing their power generation and energy storage resources. Through power flow management software electric loads, solar and energy storage can be coordinated in such a way to bring significant cost reduction in energy expenses.

San Diego Unified School District Integrated Plan

The SDUSD will play a key role in this project. With seven school sites in the project area.

Future Projects

Community Solar at Commercial Site

Within five miles of the project area, and situated in an Eviroscreen 3.0 top 5% disadvantaged community, there is commercial retail development serving many of the area residents. Retail outlets include a major grocery store, sit-down restaurants (a rarity in the community), a bank, and national retailers. The parcel also connects to an adjacent lot upon which resides a community organization.

The project team proposes approximately 1.5 MW of renewable energy to be generated from a carport solar PV system with a corresponding battery storage system (Table 9), as well as a four station EV charging installation to be funded by EVGO. The project will provide renewable

energy to the commercial tenants as well as low cost energy to the community under the pending community solar tariff.

Table 9: Battery Storage System

Design	Solar PV Carports w/ Battery Storage
Purpose	Community solar, ev charging
Site	Northgate Gonzalez Market
Generation Capacity	1.5 MW
Energy Storage	600 kW/4800 kW
Beneficiary	In Stage 1 – commercial retail tenants; In Stage 2- Chollas EcoVillage community members

Source: Groundworks San Diego

Utility Coordination Plan

Success of this master plan will depend on ensuring the existing local electric distribution system is capable of delivering the power from the proposed energy resources to the community. The attached power delivery plan (Appendix C-4c) provides a summary of work to model the proposed energy resources and evaluate the existing electric distribution system and to determine any necessary upgrades to implement an AEC. It was developed to ensure the grid operations are not adversely impacted from the project DERs.

The power delivery plan consists of five parts:

1. Understanding the current distribution system around the project area.
2. DERs required for the community to achieve ZNE.
3. Analyzing the current electric distribution circuits and determination if they can support the proposed community DER.
4. Determining areas that require further study based on a preliminary analysis impacts on the grid through the introduction of the DERs.
5. Identifying proposed points of interconnection of the initial set of DER projects.

The SDG&E Distribution Planning group collected the community hourly load data from their load forecasting group. The electric distribution circuits were modeled using Synergi power system simulation software. The simulation modelled all of the overhead and underground distribution cables and transformers along the circuit, customer load, and any local generation including roof top PV.

There are four distribution circuits feeding energy to the project area's community. Three circuits are 12 kV and one is a 4 kV circuit. The results of power system studies completed by SDG&E indicate that the proposed distributed generation for the Chollas Eco Village project for

circuits 1434 and 323 can be supported by these existing circuits. SDG&E identified that additional study work will be required for DER connected to 12 kV circuit 165 and 4 kV circuit MKI.

It is expected this additional analysis will be conducted when the interconnection application process with SDG&E starts when or if the project phase to implement the project is initiated. Greenworks San Diego expects to submit an application for interconnection request to SDG&E following the CA Rule 21 process when these plans are completed and the project implementation phase of the project begins. SDG&E can then conduct the more detailed engineering analysis necessary to determine and identify any required upgrades to the existing electric distribution system to support the proposed DER for the project.

Permitting Plan

The permit review evaluation included analysis by AECOM's Planning, Power and Energy Divisions, and coordination with the project's engineer. The results are summarized in the permitting plan (Appendix C-4d) which outlines the permits that would be required for implementing the proposed projects.

Although it was deemed premature to prepare and complete specific permits for the permitting approval process by pertinent agencies, the project team did evaluate specific project elements for applicable permit requirements. The review process included an assessment of two proposed locations on existing commercial sites located within the jurisdiction of the City of San Diego. One proposed site includes carport solar only, and the other proposed site includes carport solar and rooftop panels. The permit memo identifies the City of San Diego Zoning, General Plan Land Use designation, Community Plan, review of applicable Municipal Code sections, and discretionary permits that would be required. The memo also identifies other regulatory permits that would be required from outside agencies.

CEQA Review

The project installs PV panels on existing carports in existing parking lots and existing rooftops and associated accessory equipment at four sites. Under California law, the installing a solar energy system, including associated equipment, on the roof of existing buildings or an existing parking lot are exempt from California Environmental Quality Act (CEQA) requirements. The proposed installation of the PV solar systems and its associated equipment as proposed by the project team is exempt from environmental review.

The CEQA Review report was prepared by the project team's environmental consultant and addresses the CEQA review, project compliance considerations, and additional review and consistency with applicable General Plans and Community Plans for the proposed installation of proposed PV solar systems/facilities (Appendix C-4e).

The CEQA Review report reviews the projects as identified in this section and also provides a preliminary determination on the type of CEQA review the host facility sites would be subject to and the types of environmental documents that must be prepared. The CEQA Review further

describes the pertinent environmental analysis that may be subject to applicable governmental review, setting a pathway when resources are identified and provided to coordinate and complete the approval processes.

Regulatory Issues

To provide a pathway for community ZNE efforts, a principle goal of the project was to identify and pursue a community energy project scenario. Unfortunately, at the present time for this project area, as well as California, there exists only one regulatory pathway which provides for and allows community access to renewable energy without ownership of a renewable energy system on a participant's property - the Green Tariff Shared Renewable program.

Included as an attachment is a study and analysis performed by the Center for Sustainable Energy (CSE). The project team tasked CSE with assessing the state of current policies and opportunities for the project's vision, and consequently, any regulatory issues related to implementing projects within its master plan.

CSE amplified earlier conclusions that existing policies and regulatory frameworks fall short in allowing this AEC vision. In their report, CSE postulates and describes a solution: a well-rounded community solar program to achieve the community energy goals laid out in the project's vision for an AEC. This Community Solar program encompasses an optimal structure that supports this master plan's projects.

That proposed Community Solar program would allow the first-phase of the projects to advance to a second-phase, if funded in Phase II of the EPIC grant program. At that time, according to the new Community Solar Tariff, certain amounts of energy generation could be allocated to the project area's residents.

Briefly, the proposed Community Solar program included these elements.

- The Community Solar program would serve customers located in California's disadvantaged communities, defined as a community s identified by the CalEnviroScreen 3.0 tool as among the top 25% of communities statewide.
- A project must be installed within the same disadvantaged community as the customers it serves, or within a top 25% CalEnviroScreen 3.0 designated disadvantaged community located no more than five miles away from the disadvantaged community it serves.
- All customers of a project must be within the same top 5% CalEnviroScreen 3.0 designated disadvantaged community in each IOU's territory.
- Fifty percent of the system capacity must be allocated to low-income customers.
- Non-residential customers cannot be allocated more than 25% of the system's capacity.
- Host allocation is capped at 50% of the system's total capacity.
- Credits are based on the VNEM model, resulting in retail credits minus non-by passable charges.

The project team advocates specific amendments, variation and expansion of several key elements to the Community Solar program to best serve the project's AEC vision. These include:

- The definition of a disadvantaged community should use the IOU territory as the baseline, as opposed to statewide, which would expand the eligible number of communities who could benefit from this program, and would effectively categorize all three census tracts that make up the Project Area, into eligible communities for this community solar tariff.
- The program should employ a single eligibility threshold, for both install location and customers, to the top 25% of communities within the IOU service territory, as opposed to customers needing to be within the top 5% and/or using a statewide baseline. This would allow all utility customers within the Project to be eligible to participate in the community solar tariff.
- The proximity requirements should allow 1) a project to serve the eligible customers located within the disadvantaged community containing the installation, as well as those eligible customers located in disadvantaged communities within a five mile radius of the boundary of the disadvantaged community containing the installation; or 2) a project may serve the eligible customers located within the disadvantaged community containing the installation, as well as those otherwise eligible customers located in a cluster of up to 10 contiguous disadvantaged communities, so long as those communities are contiguous with the disadvantaged community containing the installation.
- There should be clarification regarding the dynamics between the Host and Customer allocation thresholds. There is an implied distinction between a Host and a Customer, in terms of allocation threshold. A community solar tariff should clearly confirm that the Host allocation, who is able to take up to 50% of the system capacity, is not limited by the 25% non-residential customer threshold.
- The community solar tariff cap should be expanded to allow more than 5MW worth of eligible projects in the SDG&E service territory.

Tools and Recommendation Manual

Through the project team's overall interaction and meetings with various departments at public sector agencies like the City of San Diego and SDUSD, plus conversations with key institutions like SDG&E, the big picture takeaway and recommendation regarding efficiency and effectiveness improvements for the overall development review permitting process is to "break down the formal and informal walls" between departments and groups (for example planning, building, economic development, engineering, legal, finance) to increase responsiveness, flexibility and customer satisfaction.

A development review team could combine experience and expertise to smoothly review and approve innovative, unique and novel projects like AEC proposals.

Such a team, then, adopts and implements new/best-practices to guide and support review and approval. Best Practices might fall into these categories:

- Fostering better communication among departments and teams between and applicants.
- Standardizing procedures and predictability and providing resources to enable swift and competent regulatory consideration
- Encouraging proactive planning, site selection and pre-permitting to expedite regulatory oversights before specific, time-constrained projects are proposed

Improving Communication with Permit Applicants

1) Single point of contact
2) User's guide to local permitting
3) Concurrent applications
4) Project technical review team
5) Regularly scheduled inter-departmental meetings

Standardizing the Process and Providing Resources

1) Predictable impact fees
2) Objective criteria for special permits, of-right zoning, and master plans
3) Uniform timelines, notifications, and appeals
4) Maximize the municipal website
5) Create an electronic filing process for permit applicants

Planning

1) Selecting preferred sites for development
2) Designating priority development sites under AEC parameters
3) Pre-permitting for selected sites
4) Overarching development agreements
5) Combined public hearings

A manual summarizing all these suggested best practices is found in Appendix C-4f.

CHAPTER 5:
Knowledge/Technology Transfer

Introduction

The Chollas EcoVillage is an innovative cross-sector effort to advance energy solutions in an underserved urban community in the San Diego community of Encanto. From its inception, it was oriented around central commitments that have now been tested with impressive success. These lessons learned have already been shared with a variety of audiences across the city, state, and internationally. This project is positioned to make use of three "key" lessons.

Technical Innovation and Social Innovation Are Key. Innovative energy solutions in underserved communities require technical and financial innovation, and social and behavioral innovation through new strategies of community engagement, environmental education and participatory climate action.

Collaboration Is Key. An "integral" approach to solving important social problems requires a commitment to new kinds of cross-sector collaboration – convening a variety of capacities across institutions and linking top-down and bottom-up knowledge and resources.

The Community As An Asset Is Key. Planning new energy solutions in underserved neighborhoods must mobilize the most important asset: the community. This mobilization requires unique communications and outreach strategies to overcome the many fears of disadvantaged (ranging from scams, immigration, to government and utility programs).

The Chollas EcoVillage project team strived to make scenario-specific cases for the using a community-based distributed energy system in conjunction with a comprehensive community outreach plan. By doing so, it will connect the community with clearly presented information regarding advanced energy technologies with program content defining the environmental benefits of these approaches through community outreach and education.

Industry

The project team developed a comprehensive presentation aimed at energy industry professionals to share project findings and outcomes. Presentations included:

- **Cleantech San Diego General Membership Meeting - January**. Cleantech is a network of colleagues in the clean technology, smart cities, and energy innovation fields from the San Diego region that focus and discuss timely topics of interest to the Cleantech sector. The presentation focused on the market potential for the development of largescale community solar projects under the pending tariff. Date: January 23, 2018.
- **Electric Power Research Institute (EPRI) Annual Conference and Utility Advisory Meeting**. EPRI is a not-for-profit that conducts research end-end around energy and electricity related topics. EPRI's research stretches through the electricity system from generation from nuclear, fossil and renewable resources, to how customers use energy.

Much of their work is centered around ZNE and energy affordability, with significant focus in California. The Groundworks San Diego presented its AEC blueprint it has modeled as part of the near ZNE community development in the Chollas area of San Diego. The team shared its innovative approach to advancing energy affordability for middle and lower income customers. Date: February 8, 2018.

Government

The project team shared with governmental groups the knowledge gained, lessons learned, identifiable challenges and issues as well as provided proposed solutions, and best-practices associated with, and in support of, the AEC plans. The project was presented to:

- **San Diego County K-12 Schools Sustainability Collaborative Workshop**. The San Diego K-12 Schools Sustainability Strategy Collaborative expedites the process and fosters the sharing of energy efficiency and clean energy best practices between San Diego's 45 school districts. Participants include administrators and educators from local K-12 and community college districts that fund energy efficiency retrofits, clean energy installations, and the development of energy management capabilities. Groundworks San Diego presented its AEC models for a disadvantaged community and highlighted the suggestions that project developers must engage and partner with public school districts/campuses to use properties. Schools can locate generation facilities plus serve as "anchor" customer for community energy project. Date: January 23, 2018.
- **San Diego Association of Governments (SANDAG) Regional Energy Working Group (EWG).** This group was established to provide input and feedback on issues related to the Regional Energy Strategy and tasks of the Regional Energy Planning Program. The EWG reports to the Regional Planning Committee, which reports to the SANDAG Board. The EWG comprises a mix of elected officials, business organizations, environmental groups, regional schools/universities, transit and transportation/energy researchers. The project leads presented the AEC blueprint that was modeled as part of the nZNE community development in Encanto. They shared its innovative approach to advancing energy affordability for middle and lower income customers. Date: March 22, 2018

Higher Education

The project team members at UCSD engaged in a variety of knowledge transfer activities to spread awareness of the NZE effort in the Encanto neighborhood. They presented at local, regional, national, and international events, some with high-profile attendees. They featured the project in coursework for UC students, helping to inform the next generation of climate action actors and leaders. The UCSD researchers have transferred their knowledge to policymakers, academics, practitioners, and grassroots activists, among others, including:

1. **Pontifical Academy of Sciences, Vatican, Summit: Our Planet, Our Health, Our Responsibility**. Participants included California Governor Jerry Brown, California Senate President, Kevin de Leon; US Representative Scott Peters; and public health leaders from across the world. Project member, Fonna Forman, delivered a lecture

on Climate Justice at Community Scale, where this project figured prominently as a scalable model. Date: November 2-4, 2017

2. **Meeting of the Blum Foundation Advisory Board with the University of California Blum Network.** Participants included Blum Foundation Advisory Board members (including Robert Reich, US Secretary of Labor under Clinton; and George Schultz, Secretary of State under Reagan; Laura Tyson, Chair of Economic Advisors under Clinton). Also participating were the leadership teams from the ten UC Blum Centers across the University of California campuses. They delivered Keynote lecture: The UCSD EarthLab Community Stations: Tech Transfer for Social Justice, where the project prominently served as a model for UC campuses. Date: October 30, 2017.
3. A new UCSD undergraduate course was launched in winter 2016 (and ran again in winter 2017) called Bending the Curve, presenting the Chollas EcoVillage ZNE project as the central case study of university-community partnerships for advanced energy solutions in disadvantaged communities. This course is cross-listed in the Scripps Institution of Oceanography and the Division of Social Sciences. In 2016, the class enrolled 50 undergraduate students from majors across the campus, including the natural sciences, social sciences, engineering and public health. In 2017, the class is expanding to 65 students.
4. In December 2017, a UCSD researcher recorded two video lectures that will be integrated into a system-wide University of California Bending the Curve course to be piloted in Winter 2018 at UC Irvine, UC Riverside, UC Santa Cruz, UC San Diego, UC Davis and UC Santa Barbara. One of these two videos focused on "Social Behavior" as a lever for tackling climate change - and one of the key case studies was The Chollas EcoVillage ZNE project, which connected UC San Diego researchers with the community-based non-profit Groundwork San Diego. The video will reach dozens of University of California faculty, and hundreds - and eventually 1000s — of University of California students eager to study climate change solutions.
5. As finalists in a competition to design a new Children's Science Museum for El Paso, Texas, in partnership with LA-based architectural firm, KoningEizenberg, UCSD researchers presented the project as a model of cross-institutional partnerships for advanced energy solutions in underserved neighborhoods. Date: December 4, 2017.
6. UCSD researchers presented the project to the **Advisory Board of the UC San Diego Center on Global Justice** - a diverse group of UC San Diego faculty representing six divisions and schools across the campus. Date: December 2, 2016
7. **Advisory Board meeting, UC San Diego Institute for Public Health**. Presentation of the Chollas EcoVillage project as a collaborative project of the UC San Diego EarthLab Community Station. Date: December 7, 2017.
8. **Public lecture at the University of California, Davis**, about university-community partnerships around climate justice, with the project as a model. Date: May 2, 2018.
9. **UC San Diego Center for Energy Research Seminar**. The Center for Energy Research (CER) is an organized research unit on the campus of UC San Diego. CER is composed of graduate students, researchers and partners interested in fostering research in energy studies, creating educational programs and developing models

for application of energy technologies. The project team lectured on its AEC model, the developmental process followed in forming and testing various models, creating a community energy profile based on actual IOU customer data, applying DER technologies and the community energy project feasibility study and business case model.

Case Study

Sub-consultant, Research Into Action, conducted a case study (Appendix D-5a) describing the project objectives, the team members, the actions undertaken by the project team, challenges they encountered, and lessons learned that may inform other California communities how to potentially replicate the planning process and resulting plans.

The case study team identified Phase I metrics and indicators for each project task to assess project accomplishments and conducted in-depth interviews with key project team members at two points: Midpoint interviews in June 2017 and endpoint interviews in January 2018. Interview data included information on plans, activities, challenges, resolution to challenges, and lessons learned. Provides the mid an end-point interview guides, by the project's task areas.

GLOSSARY

Term	Definition
AEC	Advanced energy community
ALJ	Administrative Law Judge
AMI	Area median income
Anaerobic digestion	A biological process making it possible to degrade organic matter by producing biogas which is a renewable energy source.
ADG	Anaerobic digester gas
BOS	Balance-of-system
CAP	Climate Action Plan
CARE	California Alternative Rates for Energy program
CBO	Community-based organization
CCA	Community Choice Aggregation
CDA	Customer-Developer Agreement
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CSE	Center for Sustainable Energy
CSF	Credit success factors
Community Solar Tariff	An alternate to the existing V-NEM tariffs, would provide that non-contiguous, non-related meters could receive the benefit and credit of locally generated renewable energy.
CSU	California State University
CVRP	Clean Vehicle Rebate Program
DER	Distributed Energy Resource
DERAC	Distributed energy resource avoided-cost calculator
DG-R	Distributed generation tariff
DR	Domestic rate
DRLI	Domestic rate low income

DWR	Department of Water Resources
EcoShare Program	SDG&E program implemented pursuant to the Green Tariff Shared Renewable program, Enhanced Community Renewables component, in which a customer agrees to purchase a share of a local solar project directly from a solar developer, and in exchange will receive a credit from their utility for the customer's avoided generation procurement and for their share of the benefit of the solar development to the utility.
EE	Energy efficient
ECR	Enhanced community renewable
EPIC	Electric Program Investment Charge
EPRI	Electric Power Research Institute
EV	Electric vehicle
EWG	Energy working group
Green Tariff Shared Renewable Program	A program adopted by the CPUC, under California Senate Bill 43, and intended to (1) expand access to all eligible renewable energy resources to all ratepayers who are currently unable to access the benefits of onsite generation, and (2) create a mechanism whereby customers and groups of individuals can meet their needs with electrical generation from eligible renewable energy resources.
GHG	Greenhouse Gas
GTSR	Green Tariff Shared Renewable
HVAC	Heating, ventilation and air conditioning system
IDER	Innovative design engineering research
IEEE	Institute of Electrical and Electronics Engineers
IOU	Investor-owned utility
JCNI	Jacobs Center for Neighborhood Innovation
Microgrid	A microgrid is a group of interconnected loads and distributed energy resources (e.g., solar, energy storage or fuel cells) within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.
NEM	Net Energy Metering
NGO	Non-government organization

NMTC	New market tax credits
PACE	Property Assessed Clean Energy
Peak load	A term used in energy demand management describing a period in which electrical power is expected to be provided for a sustained period at a significantly higher than average supply level.
PEV	Plug-in Electric Vehicle
PPA	Power Purchase Agreement
Proposition 39	A voter-approved measure in California creating the California Clean Energy Jobs program which allocates funds to California's K-12 schools and community colleges for improving energy efficiency and creating clean energy jobs.
Proposition S	Prop. S is a $2.1 billion General Obligation bond measure that was approved by 68.71 percent of San Diego voters in 2008 which funds a San Diego Unified School District capital improvements program
Proposition Z	Prop. Z is a $2.8 billion General Obligation bond measure approved by 61.8 percent of the voters in 2012 which funds a San Diego Unified School District capital improvements program
PV	Photovoltaics
ROI	Return on investment
SANDAG	San Diego Association of Governments
SB 350	Senate Bill 350 Low Income Barriers Study
SB 43	Senate Bill 43 Green Tariff
SDG&E	San Diego Gas & Electric
SDPZ	San Diego Promise Zone
SDUSD	San Diego Unified School District
SFDU	Single-family dwelling unit
SGIP	Self-Generation Incentive Program
SSRC	Social Science Resource Center
STEM	Science, Technology, Engineering, and Mathematics
TAC	Technical advisory committee
UCSD	University of California San Diego

V-NEM	Virtual net metering
ZNE	Zero net energy

APPENDICES

Appendix A: Chapter 2 Technical Documents

Appendix B: Chapter 3 Technical Documents

Appendix C: Tools and Recommendation Manual

Appendix D: Interview Guides

These appendices are found in a separation publication: CEC-500-2018-034-AP