CITY OF LAGUNA BEACH
CLIMATE ACTION AND ADAPTATION PLAN

MICROGRID RESILIENCY PLAN

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EXECUTIVE SUMMARY

With the recently established Climate Change resolution in 2022, the City of Laguna Beach is endeavoring to achieve a zero-carbon local economy consistent with the current State of California targets. As part of the City's Climate Action and Adaptation Plan (CAAP), the City commissioned a Microgrid Resiliency Plan that will lead directly to the implementation of microgrids.

Microgrids are localized and self-contained electrical systems that can generate, store, and distribute electricity independently or in conjunction with the main power grid. This often incorporates renewable energy sources and energy storage systems, enhancing energy resilience and reliability. Because of this, microgrids have emerged as a transformative solution, contributing significantly to both climate change mitigation and adaptation strategies, while addressing the region-specific threats of California coastal communities. This Microgrid Resiliency Plan encompasses a comprehensive analysis of microgrid capabilities and their alignment with diverse resiliency needs. By enabling the integration of renewable energy sources, microgrids reduce greenhouse gas (GHG) emissions, helping transition the energy landscape towards sustainability. Their flexible operation facilitates demand-side management, peak shaving, and load balancing, effectively alleviating grid strain during severe weather events. In addition, microgrids can serve as anchor points for electric vehicle charging infrastructure, promoting cleaner transportation, and further reducing emissions. As the City progresses towards a future all-electric landscape, microgrid-powered EV charging infrastructure may be necessary to support mass movement evacuations and response efforts.

In the face of escalating climate-related threats, microgrids offer a robust mechanism for climate change adaptation. During the increasingly common California heatwaves, microgrids can power cooling centers, ensuring the safety and well-being of vulnerable populations. Their ability to island from the main grid becomes a lifeline in situations of power outages caused by severe weather events. Coastal California's specific risks, such as sea-level rise, wildfires, and earthquakes, highlight the importance of resilient energy infrastructure. Microgrids, integrated with battery storage, can provide energy continuity even in the aftermath of natural disasters.

The microgrid resiliency assessment identified four priority sites – **the City Hall Campus, Corporation Yard, Community and Recreation Center,** and **Susi Q Center facilities** – as high potential opportunities for solar photovoltaic (PV) and battery energy storage system (BESS) microgrids based on their statuses as current or future emergency operations centers, critical facilities, and the high-level technical assessments. The City Hall Campus is the current Emergency Operations Center and therefore a priority facility for key City staff, the Police Department, and the Fire Station. The Corporation Yard is the primary domicile for City fleet vehicles, which are undergoing an electrification process as specified in the City's Fleet Electrification and Electric Vehicle (EV) Charging Infrastructure Master Plan. The City Council has directed the Laguna Beach Community and Recreation Center to become a new Emergency Operations Center, heating and cooling shelter, and emergency response site. Lastly, the Susi Q Center is a critical heating and cooling center. To this end, all four high-priority sites may benefit from concurrent microgrid procurement efforts to take advantage of microgrid-installer economies of scale, in procurement, contracting, and financing.

The microgrid resiliency assessment provided the following results and recommendations:

City Hall Campus

- Parking Lot: Proposed development of a 24-hour microgrid system with 386 kW-DC in carport Photovoltaic (PV) panels and a 220 kW / 1,166 kWh Battery Energy Storage System (BESS) to support the main City Hall building.
- Onsite Lift Station: A smaller 24-hour microgrid system with 67 kW-DC carport PV and a 53 kW / 307 kWh BESS is recommended to ensure its continuous operation.
- The proposed 24-hour microgrid system is estimated to have an upfront capital cost of $3.6 million, with a payback period of 16 years, and is expected to achieve $5.4 million in utility savings over 25 years.

Corporation Yard

- Aimed at enhancing the City's future electric fleet vehicles' resilience, the recommendation is for a 185 kW-DC carport PV and 248 kW / 670 kWh BESS system.
- The proposed 24-hour microgrid system is estimated to require an upfront capital cost of $1.6 million, with a payback period of 14 years, and is projected to achieve $2.5 million in utility savings over 25 years.

Community and Recreation Center

- The center could benefit from a mixed-use microgrid combining roof and carport PV systems. The suggested size is 246 kW-DC solar PV with a 186 kW / 1,730 kWh BESS, designed to serve the center's energy needs effectively.
- The proposed 48-hour microgrid system is estimated to have an upfront capital cost of $3.3 million, with a payback period of 22 years, and is expected to result in $3 million in utility savings over 25 years.

Susi Q Center

- Despite having less available space, it's proposed to install a 48 kW-DC solar PV and 93 kW / 949 kWh BESS microgrid system. This setup is expected to provide reliable heating and cooling, serving the community until the Recreation Center transitions to the new Emergency Operations Center.
- The proposed 24-hour microgrid system is estimated to require an upfront capital cost of $1.6 million, with a payback period exceeding the equipment's lifespan, and is projected to achieve $800,000 in utility savings over 25 years.

PART I

GENERAL MICROGRID OPERATIONAL STUDY AND GUIDANCE

INTRODUCTION

The City of Laguna Beach is committed to planning ahead to protect its community by implementing microgrids at designated emergency response sites, including its current and future emergency operations centers. In addition to reducing the City's overall impact on climate change, a key benefit of microgrid systems is their continued resilience and reliability even in the aftermath of natural disasters.

Based on discussions with City staff, including the Deputy Director for Public Works, Maintenance staff, and staff in the City Manager's Office, the critical facilities' microgrids require 48-72 hours of self-generated energy consumption with a 90% likelihood of ride-through, meaning the site will have a 90% likelihood of remaining operational during an extended utility grid outage. For each high-priority site, Optony performed resilience modeling based on the expected energy usage, to determine solar photovoltaic (PV) system size and battery energy storage system (BESS) sizing needed to ensure a 90% likelihood of ride-through over a conservative, 24-hour period and a prolonged, 48-hour or 72-hour period. With these timelines in mind, four of the City's critical facility sites were assessed for sufficient available space and building condition to determine the feasibility and scale of new solar PV and BESS microgrids on their roofs and/or on new parking lot carports.

The critical facilities selected for this microgrid resiliency assessment include the City Hall Campus, Corporation Yard, Community and Recreation Center, and Susi Q Center, all of which are currently served by Southern California Edison (SCE). Although these four facilities are the focus of this microgrid study, the City of Laguna Beach has ownership over other facilities located in the San Diego Gas and Electric (SDG&E) service territory. For any future microgrid projects in the SDG&E region, the City should note that SDG&E tariffs are weighted more heavily towards demand charges than energy charges, indicating that solar PV-only projects are less likely to be viable. However, microgrids with battery storage emerge as a more impactful strategy. As the City explores microgrid possibilities for its critical sites, and potentially other facilities, the integration of solar PV and battery energy storage systems are important to consider for increasing community-wide resiliency and reliability.

SITE EVALUATION METHODOLOGY

PRIORITY SITES FOR MICROGRID PLANNING

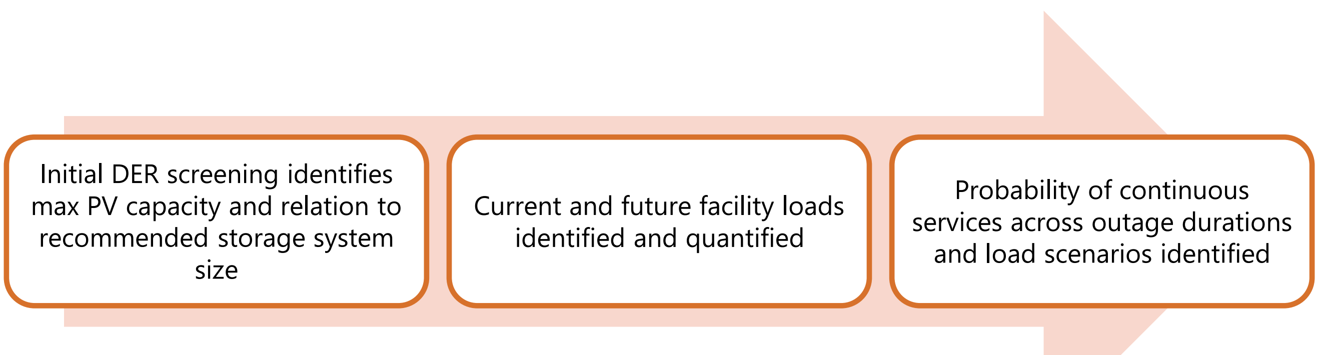
After evaluating the City's comprehensive critical facilities list, Fleet Electrification and EV Charging Infrastructure Master Plan, Local Hazard Mitigation Plan, and all relevant data, four (4) priority site locations were strategically identified as having high potential for microgrid systems.[1] The City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities were considered for rooftop and parking lot carport solar arrays and BESS microgrids. At these locations, PV generation can be maximized to account for most, if not all, of the current and future annual electricity

[1] **Microgrid:** A microgrid is a localized and self-contained electrical system that can generate, store, and distribute electricity independently or in conjunction with the main power grid. It often incorporates renewable energy sources and can operate autonomously, enhancing energy resilience and reliability.

consumption anticipated on site. The solar PV can be paired with a battery microgrid to provide resilience to the facilities, and additional demand savings can be achieved through peak shaving and energy arbitrage to reduce bills from the electrical utility.[2] [3] In this Microgrid Resiliency Plan, the Microgrid Operational Modeling and subsequent Financial Modeling are developed to prepare the City for a design-build procurement approach for a portfolio of critical facility sites.

Each priority site location was assessed to determine the maximum possible PV generation from hypothetical on-site installations. This potential generation was then combined with possible battery system sizing and associated discharge modeling, along with adjustment to account for historical site usage data, to determine the recommended PV and BESS sizing to enable the sites to reach the stated resiliency goals. For priority sites without historical site usage data, this information was estimated using similar loads at related critical facility locations. This high-level technical assessment informed the self-reliance and ride-through capabilities of each modeled microgrid system.[4] Modeled battery systems would be capable of providing 24-, 48-, or 72-hours of facility needs during 90% of the year. If the battery system receives timely O&M, the City does not have to consider a replacement after the 15-year expected lifespan because the battery will not have degraded past the 90% guarantee during the 25-year term. When on grid, the battery is utilized to provide peak shaving, which in turn allows the site to reduce demand during peak hours to provide bill savings.

Developing an accurate model requires knowledge of the variables and potential issues that could impact real world results. Use of Optony's various tools, such as HelioScope, MDOCS, and Resilience Assessment tool, allows for technical analysis that estimates a system's energy generation given certain components and the system's design, financial assessments for different scenarios, forecasting for varying future uses, and understanding the site's specific energy and power needs. Because HelioScope is a PV system



The process of preparing operational modeling of a microgrid.

[2] **Peak Shaving:** Demand-side management technique where electricity consumption during periods of high energy demand is reduced or shifted to off-peak times. This helps avoid costly peak-demand charges and reduces stress on the electrical grid.

[3] **Energy Arbitrage:** A strategy that involves buying electricity when prices are low and storing it, then selling it back to the grid when prices are high. This practice maximizes cost savings and profit potential for energy users with storage capabilities.

[4] **Ride-Through:** The ability of a power system to withstand and continue functioning during short-term disturbances or interruptions in the electrical supply, ensuring continuity of operation.

simulation software that calculates system behavior at the module level, Optony can create various PV design options with various modules to best fit the City's requirements. MDOCS is a solar and battery storage system size optimizer, with the ability to calculate how to maximize the economic benefits. Optony's Resilience Assessment tool is a proprietary algorithm that was developed to calculate microgrid resilience and ensure that the system can reach the required ride-through likelihood. Data collection, site-walks, and an understanding of the site's energy load all help to create a more accurate representation for what to expect during construction, as well as with the completed project, and ensure that the system is designed as needed to meet the City's goals for sustainability and resilience.

In order to properly evaluate the sites to confirm the microgrid feasibility studies, further investigations regarding the criteria in **Table 1** are recommended to be performed as part of the microgrid portfolio procurement approach.

TABLE 1: MICROGRID FEASIBILITY ANALYSIS CRITERIA

Criterion	Description
Shading	Survey the surroundings of the usable areas to identify obstructions that could potentially cast shadows on the solar modules and reduce output, such as rooftop HVAC equipment, rooftop access penthouses, antennas, trees, lampposts, and neighboring buildings. Even minor shading can have a profound negative impact on system performance. In order to assess the amount of direct sunlight available at each usable area, the annual sun path is plotted at various points using industry standard tools and software. Potential shading sources include tall trees, rooftop mechanical equipment, and surrounding buildings.
Electrical	Inspect electrical rooms for main breaker and switchgear amperage and voltage ratings, as well as availability of space for additional electrical equipment such as inverters. The location of the utility electrical meter(s) is important, as the distance between the solar modules and the point of connection must be minimized to reduce voltage drop, reduce costs, and increase system efficiency.
Structural	Evaluate potential challenges such as roof and structural integrity, including the age, condition, and material of the roof as well as the building and building layout.
Geotechnical	Evaluate geotechnical issues as pertains to the surrounding area of the overall site such as soil condition, water table levels, and presence of fault lines.
Environmental	Evaluate environmental criteria as related to environmental impact report requirements and other such considerations. Environmental concerns may relate to tree removal or impact on existing wildlife.

For each high-priority site, Optony performed resilience modeling based on historical energy usage, to determine PV system size and BESS sizing needed to ensure a 90% likelihood of ride-through over a 24-hour, 48-hour, and 72-hour period. Then, Optony projected the future energy consumption at each site based on the City's Fleet Electrification and EV Charging Infrastructure Master Plan, and recalculated the microgrid needs.

Informed by the 15-minute electrical usage data from the past 12 months, along with the projected charging infrastructure energy demand, Optony first developed an expected load profile for each site to be used in the MDOCS screening tool. With this, Optony then modeled theoretical microgrid operations for each sequential high-priority site to determine the probability of various resilience durations provided by the microgrid under two levels of operations maintained during a grid outage: all building loads supported, or only selected critical loads supported. The critical loads vary by site location, depending on the use case in a grid outage. Critical load-shedding is a practice of prioritizing power supply to essential equipment and services during outages, while energization is the process of restoring power to those critical loads once the situation stabilizes. Since the exact conditions of future grid outages are difficult to predict, Optony uses a simulation to analyze potential scenarios to determine the probability that the microgrid can provide power for periods of one to three days. The scenario depends on PV and storage specifications from preliminary distributed energy resources (DER) screening, modeled PV output from HelioScope, battery starting state of charge, and the starting date and time of the power outage.This methodology informed the analysis as performed for the four high-priority site locations, described in further detail below for the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities.

SITE EVALUATION RESULTS

CITY HALL CAMPUS

SITE MICROGRID DESIGN CONSIDERATIONS

The Laguna Beach City Hall at 505 Forest Ave, Laguna Beach, CA 92651, is located directly adjacent to the Fire Department Station 1 at 501 Forest Ave, Laguna Beach, CA 92651. The main City Hall building was built in 1931 and was constructed using all comb wood frame. Based on a previous study performed by Compass Energy Solutions (CES), the City Hall facility was determined to be not an optimal location for PV systems on the rooftop, based on the structural integrity and slope of the roof and the low level of sunlight due to the surrounding hills. However, the adjacent parking lot (Lot 12) to City Hall was determined to be a potential location for solar carports. During preliminary review to determine the maximum potential solar that can be installed onsite, 18 solar carport locations were identified. More details can be found in **Table 2** followed by further explanation of viability.

FIGURE 1: CITY HALL CAMPUS MAXIMUM PV SITE DESIGN

TABLE 2: SOLAR CAPACITY BY FIELD SEGMENT

Field Segment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Solar Capacity (kW-DC)	141	52	144	23	25	17	31	55	33	28	21	27	24	49	82	62	21	38
Viability	✓	X	✓	✓	X	X	X	X	X	X	X	X	X	X	X	✓	✓	X

There are obstacles to microgrid installation in Lot 12. Design options may be limited due to the tree shading, tree removal, fire clearance, nearby hillside, and the curvature of interior spaces in the parking lot. The spaces directly in front of City Hall may be shaded at times, which would reduce the efficiency of the system. The maximum PV site design may involve some environmental concerns including large tree removal and impact on landscaping. The recommended PV site design mitigates these concerns. The CES analysis indicated concern for water table issues that may impact the site's foundation, requiring deeper support structures. Although a geotechnical assessment has not been reviewed at this time, the site's proximity to the incline hill may require further review.

FIGURE 2: CITY HALL CAMPUS RECOMMENDED PV SITE DESIGN

The microgrid assessment also considered Lot 11, which is adjacent to Lot 12 but facing Broadway Street, however there may be City concerns regarding street-facing structures. In the maximum PV site design in **Figure 1** and the recommended PV site design in **Figure 2**, Lot 11 and Lot 12 are both included in the HelioScope design, to show the maximum capacity of a potential microgrid system. Regarding the City Hall building, PV rooftop was not included in this recommendation based on the structural analysis.

Depending on the City's regulations, particularly regarding tree removal permitting (e.g., Laguna Beach Municipal Code 12.06), fire clearance requirements, building code requirements, and other regulatory considerations, solar PV carport could be developed at the City Hall's parking lot.[5] The City Hall Campus would benefit from a microgrid system located in Lot 12, offsetting peak demand electrical costs, and providing resiliency during times of PSPS or power outage. This is considered a high-priority location, given that City staff, nearby Police Department, and the Fire Department Station 1 would be able to benefit from power at a key location for emergency management.

FIGURE 3: CITY HALL CAMPUS PARKING LOT BY HILLSIDE BUILDING

[5] https://ecode360.com/LA4953

Overall, Lot 12 has the potential for a maximum of approximately 731 kW PV carport system, if shade impacts and street-facing restrictions are minimal.

However, a maximized 731-kW sized system would generate an excessive amount of energy, compared to the site's expected energy consumption. Under the most recent Southern California Edison (SCE) tariff, the Solar Billing Plan allows for up to 150% offset as long as the utilization of the excess energy can be attested. To accurately capture the inclusion of the Solar Billing Plan, Optony modeled the expected municipal fleet EV charging infrastructure to attest for the future energy consumption. This justifies being allowed to upsize the City Hall system prior to the actual installation of those anticipated EV chargers.

At the City Hall, projections for future EV charging are sufficient to allow Optony to design and recommend a relatively large sized system. The main City Hall building microgrid was sized to offset up to 150% of the historical electricity usage (PV size 386 kW-DC), accounting for future EV charging. If the 150% offset design is pursued, then the City must attest to using the extra kWh in the future. The main City Hall building meter and the Lift Station meter should be pursued under a Net Energy Metering Aggregation (NEMA) interconnection agreement. With this, the system is required to be interconnected at one meter, which is referred to as the generating meter, but can be sized to fully offset 100% of energy consumption of both the generating meter as well as any benefitting meters that are located on the same parcel of land. Both the City Hall Main Building and Lift Station meters were analyzed separately for financial purposes, but ultimately are recommended to interconnect as part of a NEMA agreement with SCE. City staff and the Optony team coordinated to develop a final recommended PV size of 386 kW-DC for the main City Hall building and 67 kW-DC for the Lift Station (PV size 453 kW-DC, combined).

FIGURE 4: SOLAR ARRAY DESIGN OPTIONS

Given that City Hall is a focal point and central hub for the Laguna Beach community, visually appealing solar arrays are integral and should be discussed during project development.[6] Visually appealing solar arrays offer numerous advantages, starting with their ability to integrate seamlessly into the surrounding environment. These arrays can enhance the overall appeal of a property, potentially increasing its value. Additionally, such a design may garner public support for the City's solar energy initiatives. On the other hand, the installation of visually appealing solar arrays often comes with higher upfront costs compared to conventional solar panels, primarily due to specialized design and materials. Furthermore, an overemphasis on aesthetic design could potentially compromise the energy output and efficiency of these arrays, leading to lower overall performance compared to more traditional installations.

[6] The solar array design options are sourced from Lumos Solar and provided as architectural examples.

RESILIENCE MODELING

At City Hall, there is one service meter that serves the main City Hall building, including the onsite Police Station and Fire Station, and then there is a second service meter that serves the Lift Station. These meters were modeled separately, assuming future EV chargers for municipal fleet vehicles are placed on the main City Hall building meter.

City Hall Campus		
Address		505 Forest Ave, Laguna Beach, CA 92651
Energy Consumption (kWh/year)		543,900
Projected Future Energy Consumption Including Future EV Load (kWh/year)		754,100 (13-20 New EV Chargers)
Estimated Year 1 PV Generation of Recommended System (kWh/year)		754,200
Average Peak Sun Hours per Day		4.6
PV Size	*Maximum (kW)*	731
	Main City Hall Building Recommended (kW)	386 (100% offset)
	Lift Station Recommended (kW)	67 (100% offset)
Utility Rate Schedule	*Current*	TOU-GS-2-D
	Recommended	TOU-GS-3-E
Site Considerations		Shading Structural Environmental Geotechnical

For the main City Hall building, Optony estimated future energy consumption based on historical energy consumption and projections for future EV charging load from municipal fleet vehicles. The resilience modeling incorporated the energy consumption of the 28 EVs and 13-20 EV chargers anticipated to be installed at City Hall, according to the Fleet Electrification and EV Charging Infrastructure Master Plan. The modeling assessed maximized charging loadout per the 1:1 vehicle-to-port ratio and recommended maximized vehicle-to-port ratio in the Fleet Electrification and EV Charging Infrastructure Master Plan to produce estimated 15-minute interval load profiles. Based on this estimation, a 386 PV size and 220 kW / 1,166 kWh BESS would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages. Here, modeling shows that a 48-hour ride-through would be possible in 67% of situations, and a 72-hour ride-through would be possible in 55% of situations. If the City increases the battery capacity to 220 kW / 1,892 kWh, then a 48-hour ride through would be possible in 90% of situations. Increasing the battery size from a 24-hour ride-through to accommodate a 48-hour ride-through would increase the direct purchase cost of the PV system by 37%. If the City increases the battery capacity to 220 kW / 2,464 kWh, then a 72-hour ride through would be possible in 90% of situations. Increasing the battery size from a 24-hour ride-through to accommodate a 72-hour ride-through would increase the direct purchase cost of the PV system by 67%. The financial assumptions and further information are provided in **Part II: Microgrid Financial Modeling**.

TABLE 3: RESILIENCE SCENARIOS FOR CITY HALL CAMPUS

City Hall Campus						
Scenarios	24-hr 90% ride-through		48-hr 90% ride-through		72-hr 90% ride-through	
	Main City Hall Building	Lift Station	Main City Hall Building	Lift Station	Main City Hall Building	Lift Station
PV Size	386 kW-DC	67 kW-DC	386 kW-DC	67 kW-DC	386 kW-DC	67 kW-DC
BESS Capacity	220 kW / 1,166 kWh	53 kW / 307 kWh	220 kW / 1,892 kWh	53 kW / 519 kWh	220 kW / 2,464 kWh	53 kW / 726 kWh
BESS Duration	5 hours @ 220 kW	6 hours @ 53 kW	9 hours @ 220 kW	10 hours @ 53 kW	11 hours @ 220 kW	14 hours @ 53 kW
24-hr Resilience	90%	90%	99%	96%	100%	98%
48-hr Resilience	67%	79%	90%	90%	98%	95%
72-hr Resilience	55%	72%	76%	85%	90%	90%
Est. PV+BESS Cost	$2,907,000	$662,100	$3,996,000	$980,100	$4,854,000	$1,290,200
Marginal Increase per additional 24-hr ride-through	Base	Base	$1,089,000	$318,000	$1,947,000	$628,100
25-Yr Utility Savings	$4,486,200	$882,800	$4,774,700	$985,700	$4,895,600	$1,034,200
Payback Period	Year 15	Year 16	Year 19	Year 21	Year 21	Year 24

For the Lift Station, the 67 kW-DC PV size and 53 kW/ 307 kWh BESS would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages. Modeling shows that a 48-hour ride-through would be possible in 79% of situations, and a 72-hour ride-through would be possible in 72% of situations. If the City increases the battery capacity to 53 kW / 519 kWh, then a 48-hour ride through would be possible in 90% of situations, based on the historical energy consumption. Increasing the battery size from a 24-hour ride-through to accommodate a 48-hour ride-through would increase the direct purchase cost of the PV system by 48%. If the City increases the battery capacity to 53 kW / 726 kWh, then a 72-hour ride through would be possible in 90% of situations, based on the historical energy consumption. However, increasing the battery size from a 24-hour ride-through to accommodate a 72-hour ride-through would increase the direct purchase cost of the PV system by 95%. The financial assumptions and further information are provided in **Part II: Microgrid Financial Modeling**.

With the transition to electric fleet vehicles, the City acknowledges that to respond to emergency events may require the use of the generator or the use of backup internal combustion engine vehicles. There is an existing on-site diesel generator that can provide additional back-up support during power outage or PSPS events. Use of the diesel generator was not included in Optony's resilience modeling results.

The system size developed in coordination between City staff and Optony optimizes the available electrical capacity at the site and satisfies the estimated future energy consumption of the main City Hall building and the Lift Station. The following backup power ride-through duration shows the total hours of off-grid available energy at any point during the year should the blackout begin on that day. At this time, ride-through beyond 72-hours is not modeled (i.e., cutoff indicates 72-hours or more).

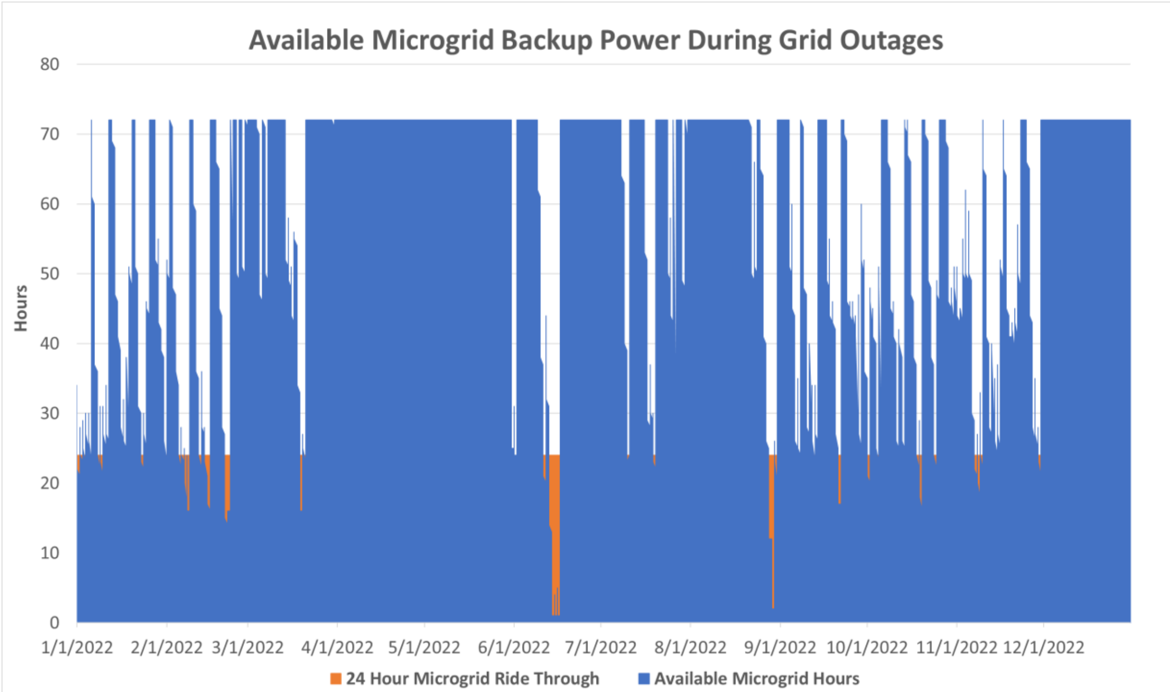


FIGURE 5: AVAILABLE MICROGRID HOURS DURING GRID OUTAGE FOR MAIN CITY HALL BUILDING WITH FUTURE EV LOAD

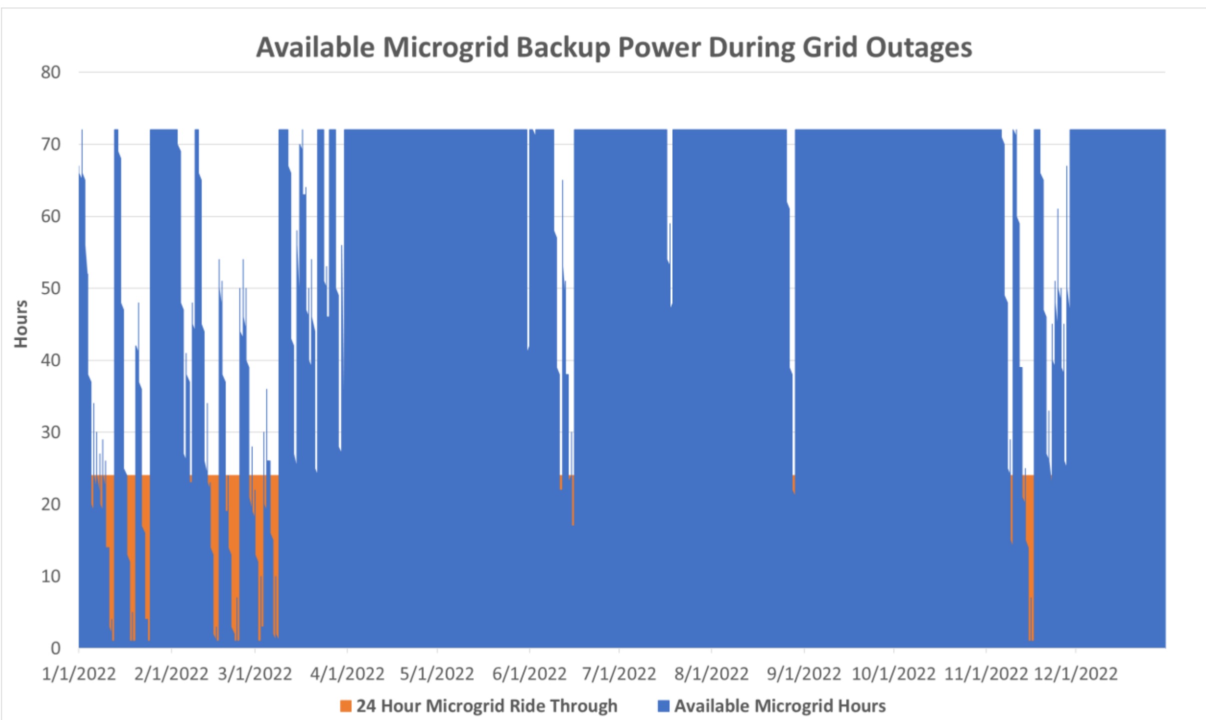


FIGURE 6: AVAILABLE MICROGRID HOURS DURING GRID OUTAGE FOR LIFT STATION

As seen in the recommended design in **Figure 2** and the operational modeling in **Figure 5** and **Figure 6**, the proposed solar PV design consists of a carport array located above the parcel's southernmost parking lot to serve the main City Hall Building and the Lift Station. This PV system is anticipated to produce approximately 754,200 kWh combined in Year 1. The recommended system is a 386 kW-DC PV size with a 220 kW / 1,166 kWh BESS for the main City Hall building and a 67 kW-DC PV size with a 53 kW / 307 kWh BESS for the Lift Station, which will not require a utility service upgrade. These microgrid designs would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages for both service meters based on projected future load with EV charging infrastructure. When accounting for the existing onsite 175 kW diesel generator, which has the capability to provide additional back-up support during emergency outage events and acknowledging that a larger battery capacity may require a costly utility service upgrade to the existing electrical switchgear, the solution that appears to best fit the constraints substantially is the system size developed in coordination between City staff and Optony.

CORPORATION YARD

SITE MICROGRID DESIGN CONSIDERATIONS

FIGURE 7: CORPORATION YARD HELIOSCOPE MAXIMUM PV SITE DESIGN

FIGURE 8: CORPORATION YARD HELIOSCOPE RECOMMENDED PV SITE DESIGN

The City Maintenance Facility, also known as the Corporation Yard, is located at 1900 Laguna Canyon Road. The City domiciles the majority of its fleet vehicles, including the historical Laguna Beach trolleys, at the Corporation Yard, so this site is anticipated to become a priority for electric vehicle charging stations, according to planning indicated in the Fleet Electrification and EV Charging Infrastructure Master Plan. The Corporation Yard parking area (Lot 16) is a large and spacious gravel lot with significant tree shading, and the roof appears to have structural integrity, indicating high potential as a PV + BESS microgrid location. However, a geotechnical assessment, electrical assessment, and structural assessment, and regulatory assessment will be needed to confirm the feasibility of this location for a microgrid. In addition, the public parking lot may be converted into a multi-level parking garage in the near future, so any microgrid designs should take the parking garage and any added energy consumption into account.

There are site-specific considerations that the City should take into account. Any solar carport at the Corporation Yard parking lot would require the removal of some of the approximately twenty or more California Sycamore trees, which may either be relocated or replaced with new trees in an alternate lot. The City may also need to perform a geotechnical and soil assessment to review whether water table issues will impact the site's foundation, requiring deeper support structures.

Since the City's fleet vehicles are intended to be electrified and primarily domiciled at the Corporation Yard, the site's current energy consumption will likely increase. Optony has developed a simulated load profile based on the Fleet Electrification and EV Charging Infrastructure Master Plan to project the percentage increase in energy consumption. **Future energy consumption includes any EV charging infrastructure load projections for all facilities.** There may be an electrical service upgrade required to handle the increased load. In addition, any microgrid design at the Corporation Yard will need to account for the height and turning radius of the Laguna Beach trolleys. The microgrid will also need to consider any potential aesthetic regulations, as a solar rooftop or carport may reflect onto nearby residents on top of the surrounding hillside. Refer to **Figure 9** and **Figure 10** for visuals of the site considerations.

In the maximum PV site design, there is the potential for PV carport arrays that take advantage of open spaces, however, the design must allow for all vehicle types – including trolleys, large equipment, and electric vehicles – to maneuver, park, and charge. There are additional benefits from covered parking on future EVs to reduce sunlight damage on fleet vehicles. Informed by discussions with City staff, the recommended PV site design includes City fleet parking carport solar arrays with a nearby battery energy storage system.

FIGURE 9: PARKING LOT CALIFORNIA SYCAMORE TREES

FIGURE 10: POTENTIAL CARPORT PARKING REGIONS

Based on this assessment, the Corporation Yard could be a high potential location for a recommended large sized solar PV of approximately 185 kW-DC, providing resilience in emergency events and simultaneously fueling the City's future electric fleet. The HelioScope design includes the parking regions along the peripheral of the Corporation Yard; however, advanced designs may need to account for the height of vehicles parked in those locations.

RESILIENCE MODELING

For the Corporation Yard, Optony estimated future energy consumption based on historical energy consumption and projections for future EV charging load for the City's electric fleet vehicles. The resilience modeling incorporated the energy consumption of the 34 EVs and 15-23 municipal fleet EV chargers anticipated to be installed at the Corporation Yard, according to the Fleet Electrification and EV Charging Infrastructure Master Plan. Based on this estimation, a 185 kW-DC PV size and a 248 kW / 670 kWh BESS would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages. Modeling shows that a 48-hour ride-through would be possible in 71% of situations, and 72-hour ride-through would be possible in 60% of situations. If the City increases the battery capacity to 248 kW / 1,091 kWh, then a 48-hour ride through would be possible in 90% of situations. However, for this second scenario, increasing the battery size from a 24-hour ride-through to accommodate a 48-hour ride-through would increase the direct purchase cost of the PV system by 41%. If the City increases the battery capacity to 248 kW / 1,438 kWh, then a 72-hour ride through would be possible in 90% of situations. However, for this third scenario, increasing the battery size from a 24-hour ride-through to accommodate a 72-hour ride-through would increase the direct purchase cost of the PV system by 74%. The financial assumptions and further information are provided in **Part II: Microgrid Financial Modeling**.

Corporation Yard		
Address		900 Laguna Canyon Rd, Laguna Beach, CA 92651
Energy Consumption (kWh/year)		196,900
Projected Future Energy Consumption Including Future EV Load (kWh/year)		296,600 (15-23 New EV Chargers)
Estimated Year 1 PV Generation of Recommended System (kWh/year)		297,000
Average Peak Sun Hours per Day		4.4
PV Size	*Maximum (kW-DC)*	664
	Recommended (kW-DC)	185 (100% offset)
Utility Rate Schedule	*Current*	TOU-GS-2-D
	Recommended	TOU-GS-3-E
Site Considerations		Structural Environmental Geotechnical Electrical

TABLE 4: RESILIENCE SCENARIOS FOR CORPORATION YARD

Corporation Yard			
Scenarios	**24-hr 90% ride-through**	**48-hr 90% ride-through**	**72-hr 90% ride-through**
PV Size	185 kW-DC	185 kW-DC	185 kW-DC
BESS	248 kW / 670 kWh	248 kW / 1,091 kWh	248 kW / 1,438 kWh
BESS Duration	3 hours @248 kW	4 hours @248 kW	6 hours @248 kW
24-hr Resilience	90%	98%	99%
48-hr Resilience	71%	90%	97%
72-hr Resilience	60%	79%	90%
Est. PV+BESS Cost	$1,559,400	$2,191,800	$2,712,600
Marginal Increase per additional 24-hr ride-through	Base	$632,400	$1,153,200

25-Yr Utility Savings	$2,520,400	$2,878,900	$3,128,400
Payback Period	Year 14	Year 16	Year 18

With the transition to electric fleet vehicles, the City acknowledges that to respond to emergency events may require the use of the generator or the use of backup internal combustion engine vehicles. There is an existing on-site 600 kW diesel generator that can provide additional back-up support for approximately 21 hours at maximum capacity during power outage or PSPS events. Use of the generator was not included in Optony's resilience modeling results. The system size developed in coordination between City staff and Optony optimizes the available electrical capacity at the site and satisfies the estimated future energy consumption of the Corporation Yard.

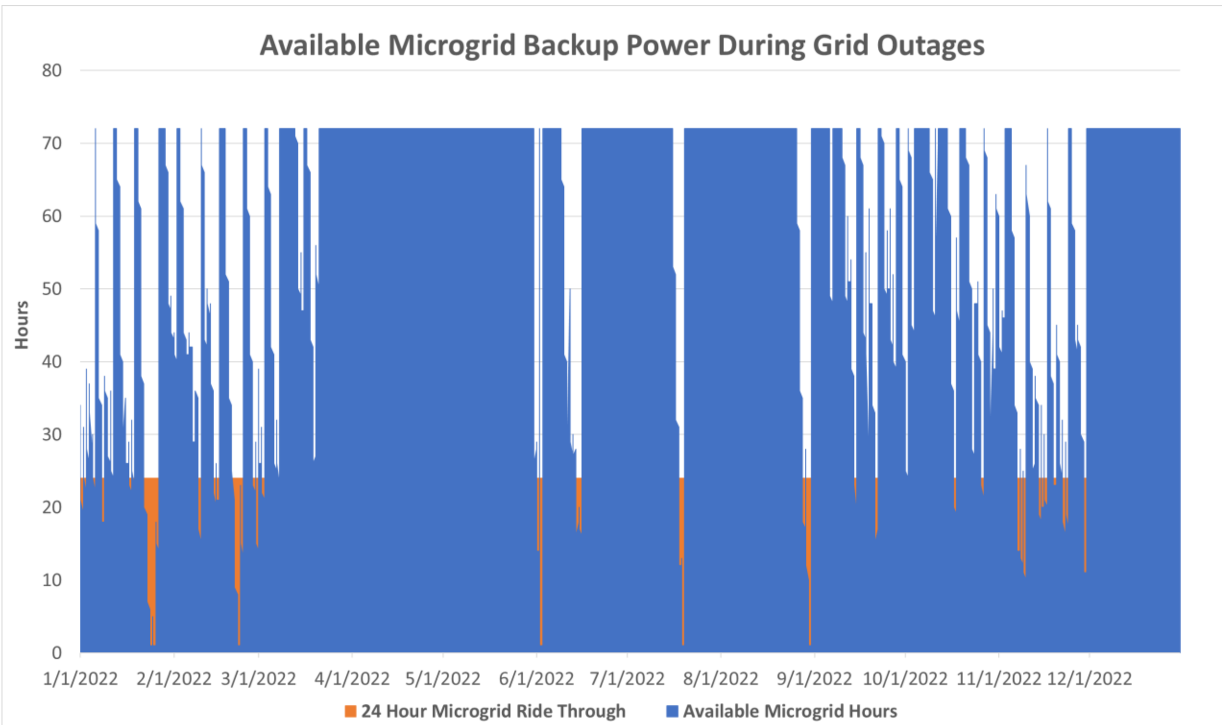


FIGURE 11: AVAILABLE MICROGRID HOURS DURING GRID OUTAGE FOR CORPORATION YARD WITH FUTURE EV LOAD

As seen in the recommended design in **Figure 8** and the operational modeling in **Figure 11**, the proposed solar PV design consists of a 185 kW-DC rooftop and carport array with a 248 kW / 670 kWh BESS, providing 24-hours of resiliency with a 90% likelihood of ride-through. As previously stated, modeling shows that a 48-hour ride-through would be possible in 71% of situations, and 72-hour ride-through would be possible in 60% of situations. This is the recommended microgrid design for the Corporation Yard, to minimize costs of the project installation while optimizing resiliency. Under this modeling scenario, the PV system is anticipated to produce approximately 297,000 kWh in Year 1. The recommended BESS for integration into the microgrid PV system is 248 kW / 670 kWh, which will not trigger a utility service upgrade. In the near-term, by working closely with solar developers to install microgrid ready components, the City can maximize savings in anticipation of the future installation of a BESS. Solar and battery installation pricing continues to increase with ongoing supply-chain constraints.

COMMUNITY AND RECREATION CENTER

SITE MICROGRID DESIGN CONSIDERATIONS

The Laguna Beach Community and Recreation Center is located at 30516 S Coast Hwy, Laguna Beach, CA 92651, previously known as St. Catherines of Siena Parish School before being acquired by the City. The Community and Recreation Center is anticipated to soon become the primary Emergency Operations Center (EOC), heating and cooling shelter, and emergency response site. In addition, the Fire Department Administration unit is in the process of transferring their command center to this location. For these reasons, the Community and Recreation Center is determined to be a key future critical facility for the City to implement a microgrid. However, the facility is not yet in use as an EOC, so the historical electrical usage and maximum peaks were estimated in the assessment.

FIGURE 12: RECREATION CENTER MAXIMUM RECOMMENDED PV SITE

Buildings A, B, C, and D on the property have regions using clay tiled roofing, which will not be covered by solar PV due to fragility concerns and structural difficulties. Alternatively, Buildings A and B have flat roofed regions which could be covered by solar PV, but they may have some structural issues and leak repairs are needed. The potential for this site is further limited due to the mechanical equipment and other obstructions covering portions of the flat rooftops. Building A, shown in the north-east of **Figure 12,** has the highest feasibility, with potential for approximately 67 kW in PV rooftop installation. Here, the maximum PV site design is the same as the recommended design.

When the Community and Recreation Center is further developed as an EOC, Building A is intended to be used as the heating and cooling center for the community. This building has minimal obstructions and/or shade impact on the flat portion of the roof. There is also a large open space, with a few trees in the parking lot of Building A. There is potential for a ground-mounted solar array to be installed over covered bleachers in the large field in front of the Community and Recreation Center. There is an existing shade structure in the south-east area of the site, near Building B, that requires further investigation to determine feasibility.

Based on this assessment, the Community and Recreation Center could be a high potential location for a large sized microgrid of approximately 246 kW in total, with approximately 179 kW in PV carport or ground mounted installations and 67 kW in PV rooftop installation.

FIGURE 14: COMMUNITY AND RECREATION CENTER PARKING LOT

FIGURE 13: COMMUNITY AND RECREATION CENTER PARKING LOT AND BUILDING

RESILIENCE MODELING

The results of the resiliency modeling for the Laguna Beach Community and Recreation Center indicated that a 246 kW-DC PV size and a 186 kW / 1,358 kWh BESS would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages. Considering the limited rooftop and physical space of the Recreation Center site, the PV system would only be able to offset 78% of the expected electricity usage, but the Resiliency Assessment tool predicts that the PV system and BESS microgrid could satisfy the full energy load for a 24-hour period. With this limited PV size, modeling shows that a 48-hour ride-through would then be possible in 65% of situations, and 72-hour ride-through would be possible in 50% of situations.

Community and Recreation Center		
Address		30516 S Coast Hwy, Laguna Beach, CA 92651
Estimated Energy Consumption (kWh/year)		529,200
Projected Future Energy Consumption (kWh/year)		529,200
Estimated Year 1 PV Generation of Recommended System (kWh/year)		415,000
Average Peak Sun Hours per Day		4.6
PV Size	*Maximum (kW)*	246
	Recommended (kW)	246 (78% offset)
Utility Rate Schedule	*Current*	TOU-GS-2-E
	Recommended	TOU-GS-3-E
Site Considerations		Shading Structural

As an alternative, if the City increases the battery capacity to 186 kW / 2,269 kWh, then a 48-hour ride through (assuming NO load-shedding) would be possible in 90% of situations, based on the estimated energy consumption. This larger PV system and BESS microgrid could satisfy 100% of the full energy load for a 48-hour period for a 90% likelihood of ride-through. Increasing the battery size from a 24-hour ride-through to accommodate a 48-hour ride-through would increase the direct purchase cost of the PV system by 49%. Lastly, if the City increases the battery capacity to 186 kW / 3,125 kWh, then a 72-hour ride through would be possible in 90% of situations. For this third scenario, increasing the battery size from a 24-hour ride-through to accommodate a 72-hour ride-through would significantly increase the direct purchase cost of the PV system by 96%. The financial assumptions and further information are provided in **Part II: Microgrid Financial Modeling**. There is not currently a generator on-site, but Optony recommends procuring a backup generator if the City wants to increase the overall resilience capabilities of the Laguna Beach Community and Recreation Center. However, the generator should be a secondary resort, to be used only if the microgrid cannot support the electrical load during power outage or PSPS events.

TABLE 5: RESILIENCE SCENARIOS FOR COMMUNITY AND RECREATION CENTER

Laguna Beach Community and Recreation Center						
Scenarios	24-hr 90% ride-through		48-hr 90% ride-through		72-hr 90% ride-through	
	Based on Estimated Load	Based on Estimated Load Building A+B Only	Based on Estimated Load	Based on Estimated Load Building A+B Only	Based on Estimated Load	Based on Estimated Load Building A+B Only
PV Size	246 kW-DC	246 kW-DC	246 kW-DC	246 kW-DC	246 kW-DC	246 kW-DC
BESS	186 kW / 1,358 kWh	186 kW / 1,042 kWh	186 kW / 2,269 kWh	186 kW / 1,730 kWh	186 kW / 3,125 kWh	186 kW / 2,306 kWh
BESS Duration	7 hours @ 186 kW	6 hours @ 186 kW	12 hours @ 186 kW	9 hours @ 186 kW	17 hours @ 186 kW	12 hours @ 186 kW
24-hr Resilience	90%	90% (81%)	97%	97% (94%)	99%	100% (97%)
48-hr Resilience	65%	66% (54%)	90%	90% (79%)	96%	96% (90%)
72-hr Resilience	50%	53% (43%)	75%	77% (59%)	90%	90% (76%)
Est. PV+BESS Cost	$2,774,700	$2,300,400	$4,141,800	$3,332,700	$5,425,200	$4,197,600
Marginal Increase per additional 24-hr ride-through	Base	Base	$1,367,100	$1,032,300	$2,650,500	$1,897,200
25-Yr Utility Savings	$3,103,500	$2,884,500	3,259,000	$3,039,100	$3,343,200	$3,039,100
Payback Period	Year 19	Year 17	Year 25	Year 22	> Year 25	> Year 25

However, if desired, load-shedding could be implemented in the form of limiting power to Buildings C and/or D, in favor of powering Building A and B as the primary heating and cooling center and buildings utilized per square footage. A 25% reduction in energy consumption was modeled, based on proportional square footage of Buildings A and B to the rest of the campus, to analyze the required battery capacity to meet the City's resiliency goals by limiting the critical load to solely Building A and Building B during grid outages. The results of the resiliency modeling for the Laguna Beach Community and Recreation Center (assuming WITH load-shedding) indicated that a 246 kW-DC PV size and a 186 kW / 1,042 kWh BESS would provide a 24-hour full ride-through in approximately 90% of annual grid outages. With load-shedding, modeling shows that a 48-hour ride-through would then be possible in 66% of situations, and 72-hour ride-through would be possible in 53% of situations. If the City increases the battery capacity to 186 kW /

1,730 kWh, then a 48-hour ride-through (assuming WITH load-shedding) would be possible in 90% of situations, based on the estimated energy consumption, and a 72-hour ride-through would be possible in 77% of situations. To increase resiliency even further, the City could increase the battery capacity to 186 kW / 2,306 kWh to provide a 72-hour ride-through 90% of the time. Whenever feasible, Optony recommends the City perform load-shedding during PSPS or power outage events to reduce the need for a larger battery capacity.

According to the Fleet Electrification and EV Charging Infrastructure Master Plan, there are not currently any EVs or EV charging stations expected to be domiciled or installed at the Laguna Beach Community and Recreation Center. However, with California's widespread adoption of passenger EVs, there may be EV charging infrastructure projects in the future that have not yet been developed. The Recreation Center was only recently procured by the City, so there may be substantial future development projects. If there are future EV charging projects, then the projected future energy consumption would increase. However, given the information currently available, the system size developed in coordination between City staff and Optony optimizes the available electrical capacity at the site and should satisfy the estimated future energy consumption of the Laguna Beach Community and Recreation Center.

Since the Laguna Beach Community and Recreation Center was only recently procured, there is limited information available regarding historical energy consumption. In addition, the Recreation Center is not yet in service as an Emergency Operations Center and future energy consumption is likely to vary. Optony scaled energy consumption projections based on available data for the electrical usage by square footage at the Susi Q Center and the general electrical needs for a facility of the size of Buildings A, B, C, and D at the Recreation Center.

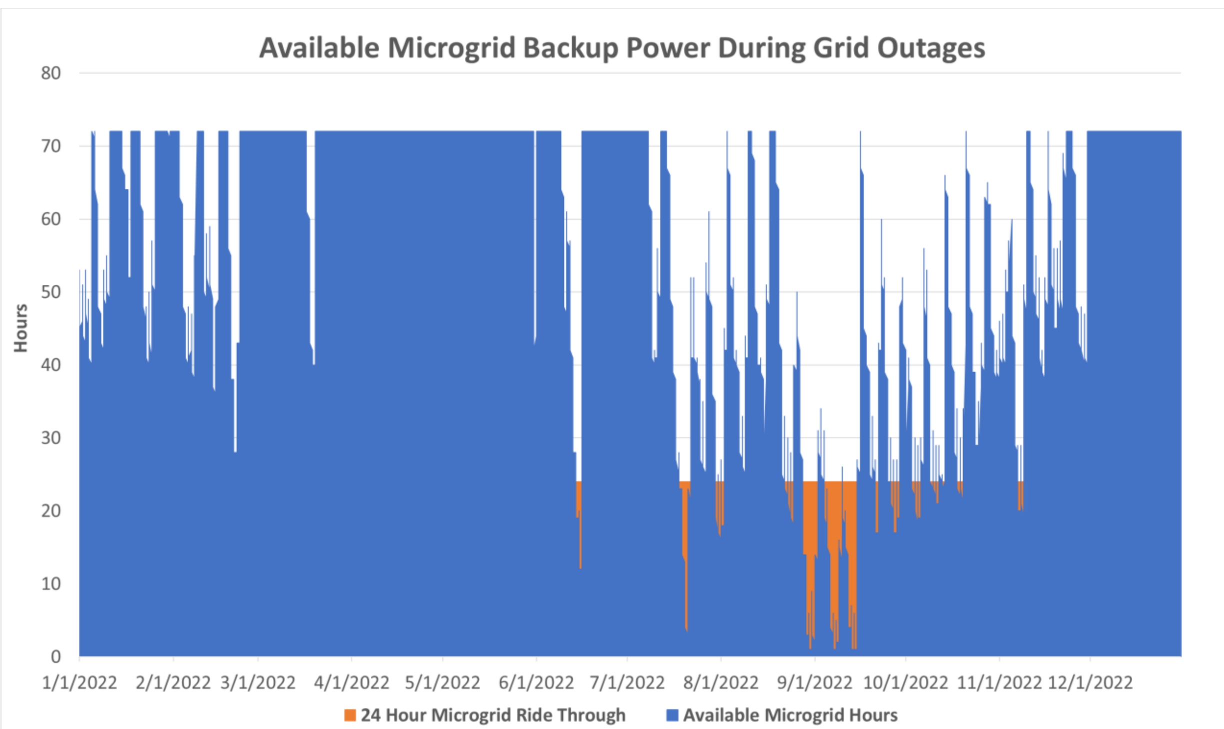


FIGURE 15: AVAILABLE MICROGRID HOURS DURING GRID OUTAGE FOR RECREATION CENTER NO LOAD SHEDDING

Optony recommends the Laguna Beach Community and Recreation Center develop a microgrid with 48-hour resilience with a 90% likelihood of ride-through, assuming the City can perform load-shedding. If the City were to prioritize Buildings A and B, then the overall energy demand can be reduced and the microgrid system can provide increased resilience. The recommended system is a 246 kW-DC PV size and a 186 kW / 1,730 kWh BESS. The PV system is anticipated to produce approximately 415,000 kWh in Year 1. This site is a high-priority location, as a future EOC, however, the utility may require the delay of installation of a microgrid at this location until the energy consumption estimates can be verified.

SUSI Q CENTER

SITE DESIGN CONSIDERATIONS

FIGURE 16: SUSI Q CENTER MAXIMUM RECOMMENDED PV SITE DESIGN

The Susi Q Center, located at 380 3rd St, Laguna Beach, CA 92651, is currently used as a general community center and for Laguna Beach Seniors programs and services. The Susi Q Center has an underground parking structure, so solar carports would not be viable at this facility. Instead, there is viable space for solar PV rooftop installation. Since the Susi Q Center was recently built in 2009, the building condition is comparatively new and is structurally sound. However, the roof has various obstacles to solar PV rooftop installation. The Susi Q Center rooftop is sized for a microgrid to provide only a small level of power offset. In addition, there are mechanical equipment and skylights that would impede larger, continuous PV arrays on the roof.

If the City is interested, this could be a potential location for a recommended small sized microgrid of approximately 48 kW to help ensure resiliency and reliable power at their current heating and cooling center for the community until the Community and Recreation Center is operational. Here, the maximum PV site design is the same as the recommended design.

There are eight (8) potential PV rooftop locations that would take advantage of the flat roofing space and the one south facing slanted roof. The structural integrity of this roof has not been assessed. There is space for one potential PV shade structure on the field in front of the facility, but this installation is not recommended based on discussions with City staff around the intended usage of the central courtyard.

Considering the limited available space at the Susi Q Center, the City may be interested in a wall-mounted BESS system in the underground parking garage, rather than a ground mounted BESS. A stringed or stacked configuration of wall-mounted BESS modules could optimize the use of available space. This approach not only addresses spatial constraints but also contributes to a more streamlined and efficient energy storage setup.

FIGURE 17: EXAMPLE GROUND MOUNT BESS (APPROXIMATELY 1500 KWH)

FIGURE 18: EXAMPLE MUNICIPAL WALL-MOUNTED BESS (APPROXIMATELY 280 KWH)

RESILIENCE MODELING

The results of the resiliency modeling for the Susi Q Center indicated that a 48 kW-DC PV size and a 93 kW / 949 kWh BESS would provide a 24-hour full ride-through (assuming NO load-shedding) in approximately 90% of annual grid outages. To ensure an even higher level of resilience, the Susi Q Center could develop practices to reduce energy consumption. If the Susi Q Center could find load-shedding opportunities, then the battery capacity size could be reduced to meet the same targets, therefore reducing the material cost projections. This load-shedding could be implemented in the form of limiting power to only essential operations (e.g., emergency lights and signs, HVAC system, communications, etc.) when the Susi Q Center is functioning as a heating and cooling center. Considering the limited rooftop and physical space of the Susi Q Center site, the PV system would only be able to offset 32% of the expected electricity usage.

Susi Q Center		
Address		380 3rd St, Laguna Beach, CA 92651
Energy Consumption (kWh/year)		264,600
Projected Future Energy Consumption (kWh/year)		264,600
Estimated Year 1 PV Generation of Recommended System (kWh/year)		83,400
Average Peak Sun Hours per Day		4.8
PV Size	*Maximum (kW)*	48
	Recommended (kW)	48 (32% offset)
Utility Rate Schedule	*Current*	TOU-GS-2-D
	Recommended	TOU-GS-2-E
Site Considerations		Shading Structural Environmental

However, the PV + BESS microgrid system could satisfy the full energy load for a 24-hour period. With this limited PV system size, modeling shows that a 48-hour ride-through would be possible in 35% of situations, and a 72-hour ride-through would then be possible in a mere 25% of situations. At high peak, maximum energy demand months, the PV system and BESS will be less likely fully support the energy load at the Susi Q Center. The City would not be able to rely on this microgrid system size for prolonged power outage or PSPS events.

As an alternative, if the City increases the battery capacity to 93 kW / 1,655 kWh, then operational modeling can only provide 48-hours with a 90% likelihood of ride-through (assuming NO load-shedding), based on the historical energy consumption. Increasing the battery size from a 24-hour ride-through to accommodate a 48-hour ride-through would increase the expected costs by 98%. If the City increases the battery capacity to 93 kW / 2,418 kWh, then operational modeling can only provide 72-hours with a 90% likelihood of ride-through (assuming NO load-shedding), based on the historical energy consumption. Increasing the battery size from a 24-hour ride-through to accommodate a 72-hour ride-through would majorly increase the direct purchase cost of the PV system by 141%. The financial assumptions and further information are provided in **Part II: Microgrid Financial Modeling**. At the Susi Q Center, the limited PV size demands a higher battery capacity to provide prolonged 48-hour or 72-hour resilience, which is not highly recommended, particularly given higher potential benefits at other site locations. Implementing a battery-only system for energy storage may not be cost-effective due to several factors, primarily the need for a significantly larger system size to meet resilience goals. Batteries are essential for storing excess energy generated by renewable sources like solar panels, allowing for consistent power availability when sunlight is unavailable. However, relying solely on batteries for energy storage means needing a larger battery bank to ensure uninterrupted power supply during extended periods of low renewable energy generation or high demand. This requirement for a larger battery system size inherently drives up the cost of the installation. Therefore, the expense of scaling up a battery-only system to achieve resilience goals can quickly become prohibitive, making it less economically viable compared to hybrid systems that incorporate other distributed energy resources such as solar. The Susi Q Center would likely be the least cost-effective site for microgrid installation; however, it could be included as part of a portfolio package with the City Hall Campus, the Corporation Yard, and the Community and Recreation Center.

TABLE 6: RESILIENCY SCENARIOS FOR SUSI Q CENTER

Susi Q Center			
Scenarios	**24-hr 90% ride-through**	**48-hr 90% ride-through**	**72-hr 90% ride-through**
PV Size	48 kW-DC	48 kW-DC	48 kW-DC
BESS	93 kW / 949 kWh	93 kW / 1,655 kWh	93 kW / 2,418 kWh
BESS Duration	10 hours @ 93 kW	18 hours @ 93 kW	26 hours @ 93 kW
24-hr Resilience	90%	100%	100%
48-hr Resilience	35%	90%	99%
72-hr Resilience	25%	57%	90%

Est. PV+BESS Cost	$1,566,900	$2,627,100	$3,771,100
Marginal Increase per additional 24-hr ride-through	Base	$1,060,200	$2,204,200
25-Yr Utility Savings	$797,100	$871,400	$924,300
Payback Period	> Year 25	> Year 25	> Year 25

The proposed system design was based on the historical energy consumption and available rooftop space at the Susi Q Center. According to the Fleet Electrification and EV Charging Infrastructure Master Plan, there are not currently any EVs or EV charging stations expected to be domiciled or installed at the Susi Q Center. As previously stated, with California's widespread adoption of passenger EVs, there may be EV charging infrastructure projects in the future that have not yet been developed. In this event, the projected future energy consumption would increase. However, there is limited rooftop space at the Susi Q Center for a solar PV system. Similar to the Laguna Beach Community and Recreation Center, there is not currently a generator on-site at the Susi Q Center, but Optony recommends procuring a backup generator as a secondary resort for emergency situations where the microgrid cannot support the electrical load during power outage or PSPS events. The system size developed in coordination between City staff and Optony optimizes the available electrical capacity at the site and will satisfy the maximum percentage possible of the estimated future energy consumption of the Susi Q Center.

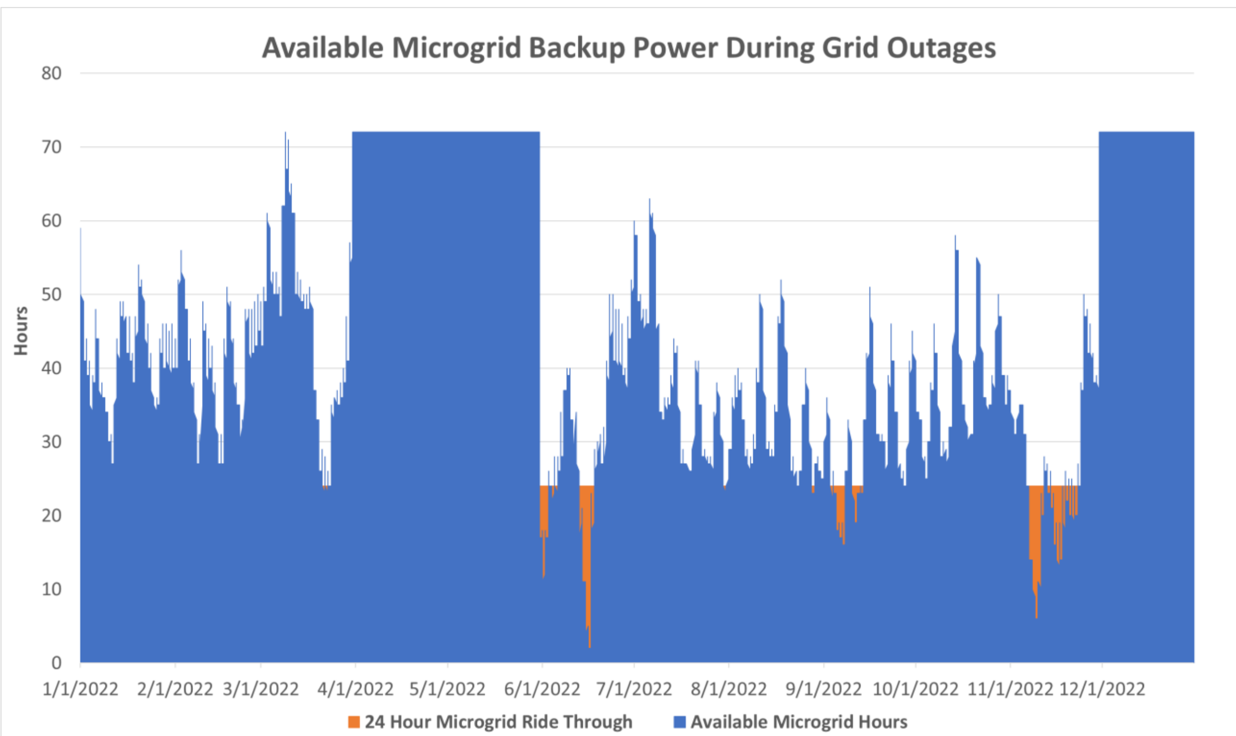


FIGURE 19: AVAILABLE MICROGRID HOURS DURING GRID OUTAGE FOR SUSI Q CENTER

To ensure 24-hour resilience with a 90% likelihood of ride-through scenario, a 48 kW-DC PV size and a 93 kW / 949 kWh BESS is recommended at the Susi Q Center, based on historical energy usage. This system is anticipated to produce approximately 83,400 kWh in Year 1. The recommended battery capacity is 93 kW / 949 kWh; however, resilience modeling is highly constrained by the limited physical space at the Susi Q Center. The BESS would likely need to be installed in the underground parking garage as a wall-mounted system, with sufficient ventilation.

HIGH-PRIORITY FACILITIES SUMMARY

The four high-priority municipal facility selections each have their respective advantages and disadvantages, and microgrids can be feasible at each site under different use-cases.

Considering the operational modeling from the recommended microgrid system sizes, all four facilities stand to benefit from rooftop and/or carport PV combined with a battery energy storage system from a minimum of 24-hour resilience with a 90% likelihood of ride-through. The maximum and recommended microgrid sizes for the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center are summarized below.

BENEFITS OF RECOMMENDED MICROGRID SIZE

	CITY HALL CAMPUS	CORPYARD	REC CENTER BUILDING A	SUSI Q CENTER
24-HR >=90% RIDE-THROUGH	✓	✓	✓	✓
48-HR >=50% RIDE-THROUGH	✓	✓	✓	☒
72-HR >=50% RIDE-THROUGH	✓	✓	✓	☒
PAYBACK BEFORE YR 25	✓	✓	✓	☒
NET SAVINGS	✓	✓	✓	☒
100% ELECTRICITY OFFSET	✓	✓	☒	☒
VEHICLE-TO-GRID / V2X OPPORTUNITY	✓	✓	☒	☒

TABLE 7: HIGH-PRIORITY FACILITIES SUMMARY

Site		City Hall Campus	Corporation Yard	Recreation Center	Susi Q Center
Address		505 Forest Ave, Laguna Beach, CA 92651	900 Laguna Canyon Rd, Laguna Beach, CA 92651	30516 S Coast Hwy, Laguna Beach, CA 92651	380 3rd St, Laguna Beach, CA 92651
Energy Consumption (kWh/year)		543,900	196,900	529,200	264,600
Projected Future Energy Consumption (kWh/year)		754,100 (13-20 New EV Chargers)	296,600 (15-23 New EV Chargers)	529,200	264,600
Estimated Year 1 PV Generation of Recommended System (kWh/year)		754,200	297,000	415,000	83,400
PV Size	*Maximum (kW)*	731	664	246	48
	Recommended (kW)	386 | 67 (100% offset)	185 (100% offset)	246 (78% offset)	48 (32% offset)
Utility Rate Schedule	*Current*	TOU-GS-2-D	TOU-GS-2-D	TOU-GS-2-E	TOU-GS-2-D
	Recommended	TOU-GS-3-E	TOU-GS-3-E	TOU-GS-3-E	TOU-GS-2-E
Site Considerations		Shading Environmental Geotechnical	Structural Environmental Geotechnical Electrical	Shading Structural	Shading Structural Environmental

At the City Hall Campus, the rooftop PV options are limited; however, ample space in the parking lot allows for potentially 386 kW-DC in carport PV and 220 kW / 1,166 kWh BESS for the main City Hall building and

67 kW-DC carport PV and 53 kW / 307 kWh BESS for the Lift Station. With emergency services and personnel located nearby (i.e., Police Station, Fire Department, City staff), this option is a high priority for microgrid installation. Meanwhile, the Corporation Yard can include an approximately 185 kW-DC carport PV and 248 kW / 670 kWh BESS microgrid system, providing resilience in emergency events while simultaneously fueling the City's future electric fleet. The Community and Recreation Center is to become the newest Emergency Operations Center and can host a microgrid with a combination of roof and carport PV, sized at approximately 246 kW-DC solar PV and 186 kW / 1,730 kWh BESS. While the amount of space the Susi Q Center is comparatively smaller, a 48 kW-DC solar PV and 93 kW / 949 kWh BESS microgrid system can help provide generally reliable heating and cooling for the community until the Recreation Center is ready to be utilized.

TABLE 8: HIGH-PRIORITY FACILITIES RECOMMENDED MICROGRID SIZE

Municipal Facilities Near-term Microgrid Sites					
Scenarios	City Hall Campus		Corporation Yard	Recreation Center (Assumes Load-Shedding)	Susi Q Center
	City Hall	Lift Station			
PV Size	386 kW-DC	67 kW-DC	185 kW-DC	246 kW-DC	48 kW-DC
BESS Duration	5 hours @ 220 kW	6 hours @ 53 kW	3 hours @ 248 kW	9 hours @ 186 kW	10 hours @ 93 kW
24-hr Resilience	90%	90%	90%	97%	90%
48-hr Resilience	67%	79%	71%	90%	35%
72-hr Resilience	55%	72%	60%	77%	25%
Est. PV+BESS Cost[8]	$2,907,000	$662,100	$1,559,400	$3,332,700	$1,566,900
25-Yr Utility Savings[10]	$4,486,200	$882,800	$2,520,400	$3,039,100	$797,100
Payback Period[11]	Year 15	Year 16	Year 14	Year 22	> Year 25

Portfolio Results (All Sites Combined)	
Total PV	932 kW
Total BESS (Recommended)	4,450 kWh – 10,171 kWh (800 kW / 4,822 kWh)
Lifetime 25-Yr Total Net-Savings[7] (Includes Total Project Costs)	$7,540,100 @24 hrs
	$10,666,800 @48 hrs
	$13,548,100 @72 hrs
Up-Front Development Capital Cost[9] (Applies To Direct Purchase Option Only)	$9,470,100 @24 hrs
	$13,936,800 @48 hrs
	$18,053,100 @72 hrs

[7] **Lifetime 25-Yr Total Net-Savings** is the accumulation of the estimated project savings, including electricity savings, reduced by PV and BESS project and maintenance costs, and offset by ITC savings, for each respective resilience scenario.

[8] **Est. PV + BESS Cost** is the estimated upfront capital project cost of the recommended microgrid system, not including maintenance costs, electricity savings, or ITC savings.

[9] **Up-Front Development Capital Cost** is the estimated immediate PV and BESS project costs for each respective resilience scenario.

[10] **25-Yr Utility Savings** is the estimated electricity savings the City may receive from the recommended microgrid system.

[11] **Payback Period** is the projected year which the recommended microgrid system would result in positive savings for the City.

Below are key assumptions used in the analysis of the proposed solar PV and BESS microgrids across all sites:

Key Assumptions

- Term: 25 years
- PV Degradation Rate: 0.5%
- BESS Degradation Rate: 3%
- Assumed PV Price: $3,000 per kW
- Assumed BESS Price: $1,500 per kWh
- Inverter Replacement Cost: $300 per kW
- Assumed O&M Cost: $10 per kW
- Annual O&M Cost Escalation Rate: 3%
- Utility Energy Escalation Rate: 3%
- Utility Demand Escalation Rate: 5%
- Assumed Incentives: 30% base ITC

<u>Disclaimer:</u> This report is provided as an illustration of the potential financial, resilience, and environmental benefits of solar PV and battery energy storage systems. This report may contain references to certain laws, regulations, tax incentives, rebates, programs, and third-party provided information that is subject and anticipated to change over time. The assumptions and price points used in the financial modeling are based on current local market conditions within Southern California Edison (SCE) territory, as of October 1, 2023.

ADDITIONAL MICROGRID CONSIDERATIONS

The City may benefit from the following general information and guidance related to the implementation of microgrids at both municipal and non-municipal facilities. When implementing microgrids, the City will need to assess the current state of condition of the facility or facilities that are under consideration, the desired microgrid resilience capabilities, and the future expected energy needs of the facility. In this section, these considerations are discussed in extensive detail, including but not limited to on-grid and off-grid modes for microgrids, power outage and PSPS events in the City of Laguna Beach, the GHG emissions reduction benefits of microgrids, standard design and electrical planning criteria, electric vehicle integration, the Net Energy Metering Aggregation (NEMA) Program, and community networked microgrids. The solar PV and BESS microgrid designs at the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities should take this general information and guidance into account.

MICROGRID RESILIENCE DESIGN AND CAPABILITIES

GENERAL INFORMATION

Microgrids can function within two separate modes: On-Grid Mode (Grid-Tied) or Off-Grid Mode (Islanded).[12] [13]

In On-Grid Mode, the microgrid is bidirectionally connected to the larger electrical grid. It can import electricity from the grid when needed and export excess electricity generated by its distributed energy resources (e.g., solar PV and battery) back to the grid. In this mode, the microgrid operates in coordination with the grid, relying on it for additional power supply or as a backup during periods of high demand or energy deficiency. This mode ensures that the community is consistently receiving local renewable energy generation and load. When tied to the larger utility grid in normal operation, microgrids would also enable the City to take advantage of Time-of-Use peak shifting or peak shaving, reducing demand charges when the price of electricity is at its highest.

In contrast, Off-Grid Mode or Islanded mode refers to the ability of a microgrid to operate autonomously and independently from the larger utility grid. In this mode, the microgrid relies solely on its renewable energy systems, backup generators, and/or BESS to provide continued electricity. This may occur during a Public Safety Power Shutoff (PSPS) event or power outage. While a facility is in Off-Grid Mode, energy storage systems must be able to power all critical facilities for the allotted time. Considering that solar peak generation times and the facility's energy consumption times may not be in alignment, the battery system must be sized appropriately to maintain critical load and avoid complete battery drain during Off-Grid Mode.

[12] **On-Grid Mode:** The operation of a renewable energy system, such as solar panels, when it is connected to the main power grid. In this mode, excess energy can be sold back to the grid, and grid power is used as needed.

[13] **Off-Grid Mode:** A renewable energy system operating independently of the main power grid. It relies solely on its own energy generation and storage capacity to meet the energy needs of a facility or location, making it suitable for remote or isolated areas.

TABLE 9: GENERAL MICROGRID GUIDEBOOK

General Microgrid Guidebook Considerations	
On-Grid Mode (Grid-Tied)	***Off-Grid Mode (Islanded)***
Optimization of Local Renewable Generation and Load	Operation of site with local power (without grid connection)
Self-Consumption (minimize energy consumption from grid)	Critical Load Isolation and Energization (Load-shedding) [14]
TOU Peak Shifting (Peak Shaving and shifting)[15]	Remote Critical Load Panel Control and Management[16]
Demand Charge Reduction[17]	Solar Renewable Power Generation Curtailment[18]
Demand Response triggered Load Management and Battery charge/discharge[19]	Diesel Genset Management[20]
Other ancillary grid services[21]	ATS Control and Management[22]
V2G enabled EV Charging	Black Start[23]

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[14] **Critical Load Isolation and Energization (Load Shedding):** Critical load isolation, also known as load shedding, is a practice of prioritizing power supply to essential equipment and services during outages, while energization is the process of restoring power to those critical loads once the situation stabilizes.

[15] **TOU (Time-of-Use) Peak Shifting:** A strategy that involves adjusting the timing of energy consumption to take advantage of lower electricity rates during off-peak hours. This helps reduce costs by shifting energy-intensive tasks to times when electricity is cheaper and less in demand.

[16] **Remote Critical Load Panel Control and Management:** The ability to control and monitor essential electrical loads from a remote location, ensuring the continuity of critical operations and optimizing energy use.

[17] **Demand Charge Reduction:** To minimize or optimize the highest level of electricity consumption (peak demand) within a specified billing period. Lowering peak demand helps reduce the charges imposed by utility companies for using their grid during periods of high demand.

[18] **Solar Renewable Power Generation Curtailment:** The intentional reduction of solar energy production during periods when there is excess energy supply or when grid conditions require it. This practice is used to avoid overloading the grid.

[19] **Demand Response triggered Load Management and Battery charge/discharge:** Demand response involves automatically adjusting energy usage in response to signals from the grid or utility to reduce demand during peak periods. Load management and battery charge/discharge systems are part of this strategy, enabling businesses or facilities to lower their energy consumption when required by the grid and use stored energy during peak times.

[20] **Diesel Genset Management:** The control and optimization of diesel generator sets for backup or primary power generation, ensuring their reliability and efficient operation.

[21] **Other Ancillary Grid Services:** Various support functions provided to maintain grid stability and reliability. These services can include frequency regulation, voltage control, and reserve capacity to help balance and secure the electrical grid.

[22] **ATS Control and Management:** The automatic switching between primary and backup power sources, such as a generator or the grid, to maintain uninterrupted power supply during outages or changes in power quality.

[23] **Black Start:** The process of restoring electrical power to a grid or part of a grid that has been completely shut down, often after a widespread blackout, without relying on external power sources. It involves using local generators or other methods to initiate the recovery of the grid's operation.

Public Safety Power Shutoff (PSPS) events involve proactive power outages implemented by utilities to reduce the risk of wildfire during extreme weather conditions and have become a significant concern for communities located in the State of California. Given this context, the City of Laguna Beach could rely on microgrid islanding as a valuable solution to mitigate the impact of PSPS events and maintain critical operations in the event of an emergency.

During a PSPS event, when the utility grid goes offline, a properly designed and implemented microgrid can disconnect from the grid and continue to supply power to designated loads within its boundaries. This capability ensures that essential services, critical facilities, and vital infrastructure can remain operational, even when the surrounding area experiences a power outage. Once power returns, islanded microgrids experience a black start: the ability to initiate and re-establish power generation and distribution without relying on external sources. For the City's critical facilities, a microgrid could ensure self-sufficiency for a designated period, preferably 48-72 hours, which could be even further extended with an automated or manual energy shut-off switch at facilities to reduce power drain by non-essential operations.

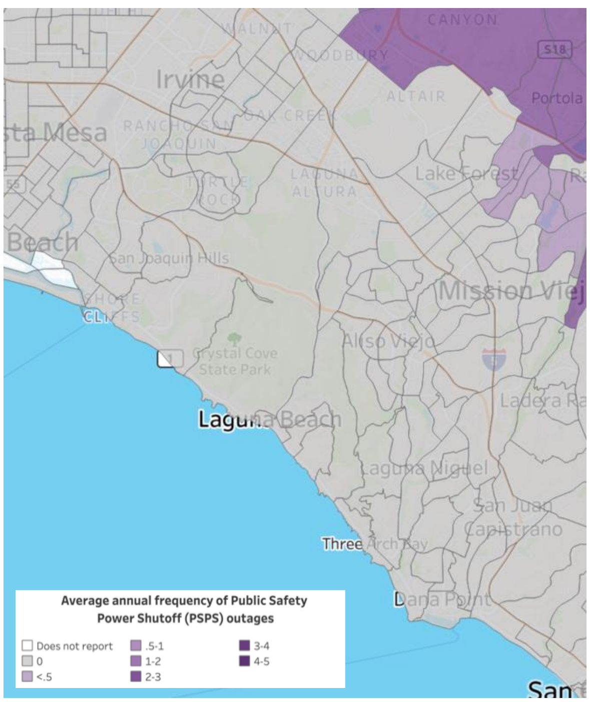

FIGURE 20: PUBLIC SAFETY POWER SHUTOFF EVENTS NEAR LAGUNA BEACH REGION

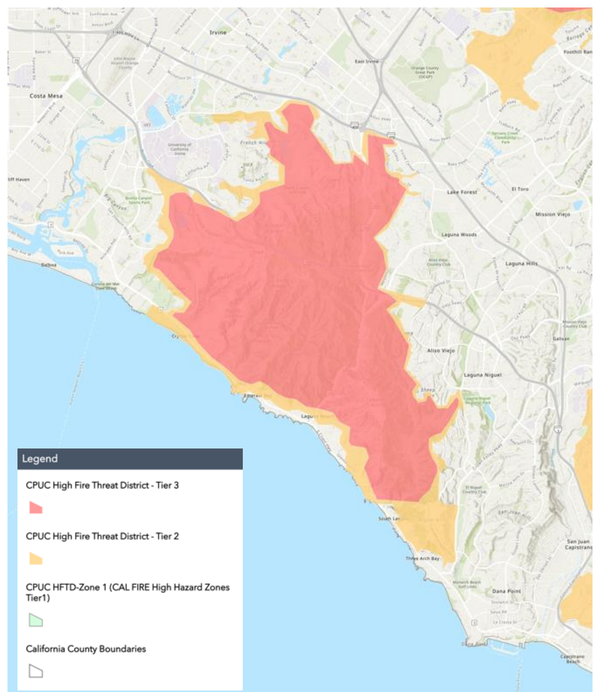

FIGURE 21: CALIFORNIA PUBLIC UTILITIES COMMISSION HIGH FIRE THREAT DISTRICTS

The maps in **Figures 20 and 21** display the frequency of PSPS events and the districts that have high fire threats, respectively. High fire threat districts, such as the Orange County district that Laguna Beach is in, are prone to PSPS events. Laguna Beach stands to significantly benefit from microgrid systems, to ensure that its critical facilities can remain online in the event of an emergency.

ENVIRONMENTAL IMPACTS

With the consideration of the City's plan to achieve a zero-carbon local economy consistent with California targets, the environmental impacts of the proposed solar PV and BESS microgrids have been analyzed. The current Southern California Edison (SCE) energy mix used to power the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities is estimated to produce approximately 580 pounds of CO_2 or 0.0002631 metric tons (MT) of CO_2 per year per MWh of electricity.[24] The City's added microgrid solutions would eliminate approximately 408 $MTCO_2$ emissions from the environment per year, with the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities each removing 198 MT, 78 MT, 109 MT, and 22 MT of CO_2 per year, respectively. The PV systems will generate clean, local energy, while the BESS will take the place of most - if not all - the associated generator emissions, eliminating generator use except for exceptionally long-lasting emergency situations.

By supplementing the utilization of the onsite 600 kW diesel generator at Corporation Yard or the onsite 175 kW diesel generator at City Hall with solar PV and BESS, the City can reduce the amount of CO_2 emissions from burning fossil fuels. At City Hall, for example, the City is estimated to reduce CO_2 emissions by 0.05 MT for every hour the generator does not need to run.[25] This assumes the generator utilizes an average of 22.1 gallons of diesel per hour, based on specifications of similar makes and models on the market.[26] Considering the average outage length in the given area is approximately 2 hours and interruptions occur approximately 1.125 per year, the City would reduce its total annual greenhouse gas (GHG) emissions by approximately 408 $MTCO_2$ per year.

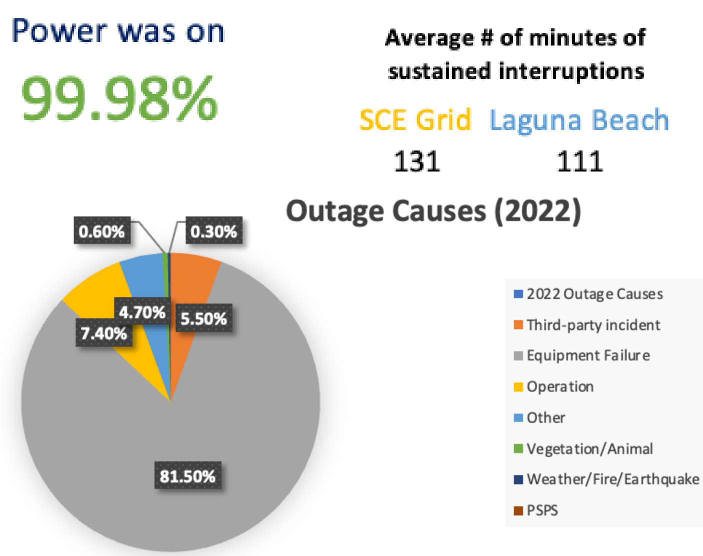

FIGURE 22: POWER IN THE CITY OF LAGUNA BEACH

[24] https://www.energy.ca.gov/filebrowser/download/4676

[25] https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

[26] https://www.generac.com/Industrial/products/diesel-generators/configured/300kw-diesel-generator

STANDARD DESIGN PLANNING CRITERIA

When designing microgrids for the City, several key considerations come into play, including design standards, manufacturers, and commercially available products to best support reliable operation. For support in design and planning of the microgrid installation process, the City of Laguna Beach may partner with the Southern California Regional Energy Network (SoCalREN), which is administered by the County of Los Angeles, to define a successful procurement pathway for microgrid installations and comprehensive technical assistance.

Design standards play a crucial role in ensuring the safety, performance, and interoperability of microgrid systems. For instance, the Department of Energy (DOE) and National Renewable Energy Laboratory (NREL) with the industry support of the Institute of Electrical and Electronics Engineers (IEEE) prepared the IEEE 1547 Interconnection series and 2030 Smart Grid Standards for Distributed Energy Resources Interconnection and Interoperability with the Electricity Grid. The standard provides requirements relevant to the performance, operation, testing, installation evaluation, commissioning, safety considerations, and maintenance of the interconnection. The City of Laguna Beach should adhere to relevant and most recent industry standards and guidelines, along with any regulations determined by the California Public Utilities Commission, to ensure the quality and compatibility of the microgrid components and systems.

When selecting manufacturers for microgrid components, it is important to consider their relevant experience, expertise, and track record in delivering reliable and resilient systems. Optony recommends working with established manufacturers with experience in microgrid technology to help ensure the City of Laguna Beach has access to high-quality, durable, and proven equipment. Commercially available products for microgrids may vary based on specific site requirements, but some common components include energy storage systems, renewable energy sources, advanced inverters, and control systems. These products are offered by a variety of manufacturers including but not limited to Tesla, Siemens, Schneider Electric, ABB, and many others.

While the products may have slightly different life expectancies and warranties depending on their manufacturers, general figures based on industry standards can be assumed for early-stage cost analysis. Battery energy storage systems have an expected lifetime and standard warranty of 15 years. PV modules have an expected lifetime and performance warranty of 25 years, with a 5-year production warranty. Inverters have an expected lifetime and standard warranty of 15 years, respectively. While these figures are commonly seen in the industry, there are opportunities to increase or decrease warranty durations based on the needs of the client.

TABLE 10: TIMELINE FOR STANDARD COMPONENT WARRANTIES

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
PV Module	*Expected Lifetime*																									
	Standard Warranty																									
PV Inverter	*Expected Lifetime*																									
	Standard Warranty																									
Battery Storage	*Expected Lifetime*																									
	Standard Warranty																									

To improve the energy storage capabilities of the system, battery technologies from manufacturers like LG Chem, Panasonic, and BYD are often used in microgrid applications to store excess renewable energy and provide backup power when needed. Evaluating product specifications, performance, and warranties can help the City of Laguna Beach make informed decisions about the most suitable products for their microgrid implementation.

In addition, the design of the microgrid system should consider methods of operation during emergency events. The microgrid should be designed to automatically detect grid failures or other emergencies and seamlessly transition into islanded mode. This requires robust control systems and advanced protection mechanisms to ensure a smooth transition, prioritize critical loads, and manage power distribution within the microgrid.

ELECTRICAL SERVICE PLANNING CRITERION

When planning for the implementation of microgrids, the City will need to ensure that its facility electrical systems have sufficient capacity to accommodate current and future load requirements. Microgrids that are intended to operate in parallel with the utility grid or facilitate bidirectional power flow require specific grid interconnection standards, so an electrical upgrade may be required at the City's various municipal sites considering microgrids. Different levels of microgrids will require different tiers of electrical upgrades. For reference, general information on the electrical considerations for a microgrid has been included in this Microgrid Resiliency Plan.

For a solar + BESS microgrid, the electrical interconnection between the microgrid and the facility main switchgear will typically be physically placed between the utility meter and the main breaker, or between the main breaker and the loads. As with a back-up generator, an Automatic Transfer Switch (ATS) must be in place to prevent the microgrid from exporting power to the grid in the case of an outage. This requirement is critical to ensuring that utility lines are not energized while work crews may be handling the wires or other equipment. However, unlike an ATS for a generator, a solar + BESS microgrid must allow output to reach facility loads with self-generation power first, before receiving energy from the grid, allowing for a reduction in the usage of utility-produced power. In this way, a solar + BESS microgrid is an improvement on a back-up generator, in that the generator only provides support during a grid outage, whereas the microgrid can operate to reduce utility costs during normal grid operations, while also providing off-grid back-up during outages.

For interconnection of the microgrid, the bussing rating of the switchgear must be capable of accepting the amperage of the maximum output of the solar + BESS microgrid. For example, a 2000-Amp switchgear would not be rated to accept a 2500-Amp microgrid output. If the switchgear bussing rating is lower than the amperage rating of the microgrid, the switchgear may need to be replaced. Similarly, if the switchgear needs to be upsized to handle output from a microgrid, the utility feeder, and the transformer serving the feeder, may need to be upsized. Both switchgear replacement and utility equipment upsizing are scopes of work that would likely require additional project costs to the City. To avoid the necessity of such work, the microgrid should generally be sized to keep maximum output below the bussing rating of the existing switchgear.

One way to enable a lower microgrid output rating, while maintaining a higher desired resiliency from the microgrid, is to reduce the BESS capacity size, while increasing the duration in hours for which the BESS can operate. For example, a 500 kW / 2-hour BESS would provide 1,000 kWh of energy. However, the 500-kW output might be higher than the switchgear would allow. If the BESS is reduced to 250 kW, but the duration is increased to 4 hours, the same number of batteries and energy production capability (1,000 kWh) would be present, but at half the maximum output.

To make the energy capability of the microgrid last for as long as possible, facility electrical loads should be reduced, or shed, during a grid outage. This can be performed automatically through a critical loads panel that powers only key energy drawers (such as bathroom lighting, elevators, IT room) when the microgrid moves into off-grid operation. Alternatively, loads can be shed manually by turning off unnecessary lights, unplugging unnecessary plug-loads, and trying to minimize electrical usage that comes from the microgrid. The goal of load-shedding is to reduce energy usage to or below the level of energy that the solar system recharges the BESS over the day. If this can be achieved, the microgrid can, theoretically, keep the facility powered off-grid indefinitely. Combining the solar + BESS microgrid with a new or existing natural gas (or diesel) generator can further extend microgrid resiliency times, though perhaps at the expense of fossil fuel emissions.

To prepare for microgrids to be installed at municipal facilities, all sites will first need to be assessed to determine whether an electrical upgrade is necessary. The process will include an assessment of the facility's current switchgear power capacity and the estimated future average and maximum power loads.

ELECTRIC VEHICLE INTEGRATION GUIDANCE

The City's Emergency Preparedness Plan should evaluate the integration of microgrids and electric vehicles. This integration may include facets such as microgrid backup power for Level 2 and DCFC chargers, microgrid-enabled charging stations paired with battery energy storage, and grid-edge and off-grid power systems to ensure the City of Laguna Beach can take full advantage of resilience capabilities.

According to the Fleet Electrification and EV Charging Infrastructure Master Plan, the City aims to transition the municipal fleet to EVs, thereby reducing the City's GHG emissions, leading in sustainable transportation, and aligning with the City's Climate Adaption and Action Plan. To leverage the potential synergy between microgrids and electric vehicle supply infrastructure (EVSE), the City may choose to be proactive in planning EV charging infrastructure design and placement, microgrid size and scale, electrical demand response strategies, and Vehicle-to-Grid (V2G) power management.

EV INFRASTRUCTURE DESIGN AND PLACEMENT

The City of Laguna Beach should strongly consider microgrid-enabled charging stations, which would enable the City to not only continue charging electric fleet vehicles throughout power outage events, but also optimize the daily use of charging stations.

Depending on the use case for a critical facility site, different electric vehicle charging solutions can be optimized to benefit the City. The Corporation Yard is a potential microgrid site for future electric fleet vehicles that intend to be parked for long periods. For prolonged charging periods, Level 2 chargers can preserve battery longevity, and help reduce reliance on the grid, mitigating the risk of power disruptions due to weather events or emergencies. For sites that have vehicles with a higher turnaround (e.g., Police Department, Fire Station, etc.), a DCFC solution can offer significantly faster charge times. The use of a microgrid could allow Level 2 chargers and DCFCs to operate at full capacity during emergency situations.

In the planning and design process, the City should prepare to incorporate EV charging infrastructure within microgrid design by strategically locating charging stations close to microgrid electrical service systems at critical facilities and public spaces. Minimizing this distance will subsequently reduce trenching and installation fees for the City when construction work begins. The City will also ensure that their electric fleet can access reliable and renewable energy sources while contributing to the overall resilience of the microgrid system.

Optony recommends that the City design microgrids, particularly at the Corporation Yard, with scalable EV charging capacity to accommodate future growth in EV adoption and implement smart charging solutions that allow for flexible power management and load balancing.[27] Future-proofing the microgrid by anticipating the needed future power capacity will help the City use its available land and energy resources efficiently and effectively.

ELECTRICAL DEMAND RESPONSE STRATEGIES

As part of microgrid resilience capabilities, the City may choose to explore demand management strategies, such as Time-of-Use peak shaving or load shifting, to better balance the energy draw on their microgrid system.[28] Time-of-Use (TOU) pricing is a utility pricing structure where the cost of electricity varies based on the time of day and the demand on the electrical grid. Under TOU pricing, electricity rates are typically divided into different time periods or "blocks," such as off-peak, mid-peak, and on-peak periods, each with their own price. Load shifting, also known as demand response, is a strategy that involves shifting or redistributing the timing of electricity usage to take advantage of TOU pricing. It involves modifying energy consumption patterns by reducing electricity usage during high-demand, on-peak periods and increasing usage during low-demand, off-peak periods. The purpose of load shifting is to optimize energy usage and minimize costs by aligning electricity consumption with lower-priced periods. For instance, the City could utilize charging management software to monitor, control, and optimize the charging of its fleet vehicles. Charging management software provides a range of features, such as automatically prioritizing charging for emergency response vehicles, shifting charging times to lower-priced TOU blocks, or controlling charging session initiation and termination. By shifting energy-intensive activities or adjusting the operation of appliances, municipal or non-municipal facilities alike can reduce their electricity bills and help balance the load on the electrical grid.

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[27] **Load Balancing:** The distribution of electrical or energy loads evenly across various sources or devices to ensure that power supply matches demand. This helps maintain system stability and efficiency.

[28] **Demand-side Management:** Strategies and technologies that are used to control and optimize the consumption of electricity by consumers, businesses, or institutions. It aims to reduce peak demand, lower energy costs, and improve grid stability through methods such as load shedding and load shifting.

VEHICLE-TO-GRID POWER MANAGEMENT

The City is also encouraged to consider Vehicle-to-Grid (V2G) technology, which enables bidirectional power flow between EVs and the connected facility microgrid, enabling EVs to serve as energy storage assets and provide grid support during peak demand or emergency situations. Similarly, Vehicle-to-Home (V2H) technology enables bidirectional power flow between EVs and a home or building. Particularly for critical facility locations, V2G has the potential to enhance communitywide grid stability and reliability, or V2H could provide power backup for an EOC during a PSPS or grid outage. It is important to note though that successful deployment of V2G requires compatible charging infrastructure and bidirectional power flow capabilities in both charging stations and the grid. The technology managing these connection points must meet industry and regulatory standards, utility company voltage and frequency standards, and interoperability requirements. V2G technology is a rapidly evolving field, and various pilot projects are already underway. Currently, Pacific Gas & Electric is exploring a vehicle-to-grid residential program, a vehicle-to-grid commercial program, and a vehicle-to-microgrid program, so the City of Laguna Beach should watch for similar projects offered by SCE. In the area, various school districts are pursuing V2G pilot projects (e.g., Torrance, Kings Canyon and Napa Valley school districts, along with Cajon Valley Union School District supported by SDG&E's Power Your Drive for Fleets program). The City of Laguna Beach is recommended to consider the feasibility of a V2G pilot project within the next 3-5 years at key facilities, to further increase grid resiliency, and stay informed on SCE and SDG&E programs and policies in the near-term. As additional EVs come onto market with V2G, V2B, or V2X technology, the City would benefit from prior experience and understanding.

Currently, the number of EVs on the market with bidirectional charging capabilities is extremely limited. Only the Nissan Leaf – which is soon to be succeeded with a new model in 2026 – and the Ford F-150 Lightning offer V2G and V2H, respectively, but the technology will continue to advance with further research. As the EV market continues to grow and the City's grid evolves, V2G or V2H have the potential to play a significant role in the City's energy landscape.

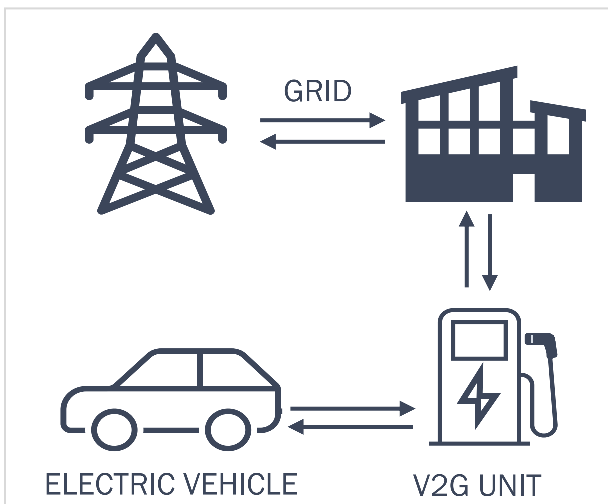

FIGURE 23: VEHICLE-TO-GRID DIAGRAM

Integration of scalable BESS provides flexibility for future charging demands, and with V2G technology trending in the EV industry, a parking lot can also be a large BESS. While V2G technology is still relatively new with limited options in the market, the City should consider installing compatible infrastructure that allows bidirectional power to maximize environmental, economic, and resiliency benefits. If installed, V2G will allow EVs to become part of the microgrid as well as the main grid, contributing to more stable and reliable energy supply for critical systems, however limited compatible models in the present market tapers the immediate benefits. The City can take advantage of the ability to combine construction costs and system design choices, however the benefits may not be seen until the

V2G sector further evolves. By strategically integrating EV charging supply equipment or V2G power management with microgrids, the City can better harness the benefits of local clean energy generation.

MICROGRIDS AT NON-MUNICIPAL FACILITIES

To further advance the implementation of communitywide microgrids beyond municipal facilities, the City may explore the option of deploying clean power backup systems at critical facilities that are not owned by the City. For instance, the City can evaluate the potential for community solar projects at educational facilities like Laguna Beach High School or the Laguna Beach Unified School District Warehouse. These sites, with their large open spaces or close proximity to hills, offer opportunities for solar installations that can generate clean energy for the community. These projects would involve collaborating with key stakeholders and private entities to assess the feasibility and potential benefits of integrating clean energy microgrid solutions, most likely through solar PV and BESS, into the backup systems of these vital community assets. Additionally, the City can explore the feasibility of procuring parcels to interconnect its City-owned facilities, creating a network that allows for the integration of advanced grid technologies through a Net Energy Metering – Aggregation (NEM-A) Program to offset electric utility costs. By doing so, the City can enhance the overall resilience and reliability of its infrastructure while contributing to a more sustainable and environmentally friendly energy landscape.

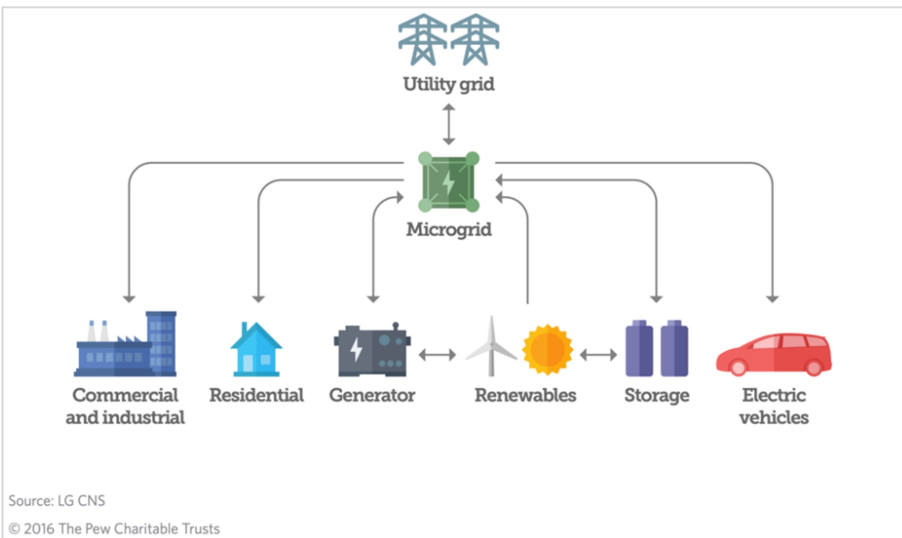

FIGURE 24: MICROGRID INTERCONNECTION DIAGRAM

NETWORKED MICROGRIDS

If the City is looking to enhance its resilience capabilities on an even broader communitywide scale, Optony recommends that City staff explore the potential of networked microgrids spanning multiple facilities in Laguna Beach. Networked microgrids refer to an advanced and interconnected system of localized energy grids designed to operate both independently and collaboratively. Unlike traditional microgrids that function in isolation, networked microgrids are linked through a communication infrastructure, allowing them to share information, resources, and energy. This interconnectivity enhances overall system efficiency, reliability, and resilience. In networked microgrids, surplus energy from one grid can be seamlessly transferred to another experiencing a shortage, optimizing energy distribution across a broader network. The coordination among microgrids in a network also enables better load balancing, reducing the risk of grid failures and enhancing the overall stability of the energy infrastructure.

The concept of networked microgrids aligns with the modern vision of a smart and interconnected energy grid that maximizes efficiency, sustainability, and resilience. Networked microgrids operate through advanced communication and control systems, facilitated by the Internet of Things (IoT) devices, sensors, and sophisticated control software. In this interconnected framework, each microgrid continuously monitors its energy production, consumption, and overall system health. The shared data among microgrids provides a comprehensive view of the entire energy ecosystem. A centralized control center oversees the network, making informed decisions about energy distribution, load balancing, and system optimization across the network. The interconnected nature of these microgrids enhances resilience, ensuring that if one unit faces a disruption, others can compensate to maintain a stable energy supply, minimizing the risk of widespread power outages.

The driving force behind the pursuit of community networked microgrids in Laguna Beach is to mitigate the risks associated with power system failures. Such failures can trigger cascading issues with potentially devastating consequences. For instance, pumping plants integral to water, wastewater, and floodwater management could cease operations, leading to scenarios where critical areas, including roadways, become inundated, increasing the risk of mudslides, or causing blockages. The significance of addressing these challenges becomes evident in the potential disruption of essential services, illustrating the critical role microgrids play in maintaining the City's functionality during emergencies.

However, establishing a community networked microgrid involves navigating legal and ownership intricacies, determining operational and maintenance responsibilities, installing extensive communication lines and underground trenching, and addressing other considerations emerging from planning discussions. These complexities are inherent to the nature of interconnected technologies and must be carefully managed to ensure the effectiveness of any networked microgrid system.

For instance, if the City of Laguna Beach established a networked microgrid system, the microgrid at City Hall could support the microgrid at Susi Q Center, or the other way around. These microgrids would be interconnected across the City, keeping streetlights and communications on, powering traffic signals, or charging electric cars in the City's fleet. However, as mentioned, this implementation would require a huge, coordinated effort across municipal microgrid installations and service providers to access the utility grid.

In terms of implementation, the City would need to closely collaborate on partnerships with the local utilities, particularly SCE, to ensure successful connection. Although this process comes with challenges, as observed in previous networked microgrid attempts such as in the City of Berkeley or the Lancaster Advanced Energy Community (AEC) Project. The City of Berkeley developed the Berkeley Energy Assurance Transformation (BEAT) project using a $1.5 million grant from the California Energy Commission's Electric Program Investment Charge (EPIC) to design a clean energy microgrid community.[29]

[29] https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2019-014.pdf

This microgrid project was designed to provide backup clean energy to key Berkeley municipal facilities. However, the BEAT project encountered numerous financial, legal, and policy obstacles preventing the usage of existing utility lines or the addition of new distribution lines. Meanwhile, EPIC also funded the Lancaster AEC Project, developing community microgrids for the formation of a Virtual Power Plant.[30] The AEC Project is underway in downtown Lancaster, connecting community distributed energy resources and Zero Net Energy affordable housing buildings, schools, and commercial sites. The City of Laguna Beach could also consider the development of a similar community-wide microgrid project. Potentially, the City could explore independence from SCE service for its municipal facilities on microgrids, however, this would require extensive research prior to commitment. Alternative solutions, such as for behind-the-meter PV+BESS systems or mobile generator docking stations, would also be viable pathways to bolster the City's resiliency during emergencies.

In times of crisis or during peak demand, this networked approach ensures a more stable and reliable power supply. Networked microgrids would create a web of energy support, where different parts of the City can assist one another, reinforcing the overall energy infrastructure. Ultimately, any community networked microgrid project will require integral collaboration between policy makers, economists, engineers, and all involved stakeholders. Optony is available if the City of Laguna Beach is interested in expanding the microgrid assessment to explore a communitywide, networked system for key municipal or non-municipal facilities in the future.

FUTURE CONSIDERATIONS

The addition of microgrids at municipal facilities adds resiliency that allows critical operations to continue as needed with onsite renewable energy generation in emergency situations. As facility energy consumption and electric vehicle fleet energy consumption fluctuate and increase over time, the City will need to regularly fulfill energy consumption trends. In order to maintain 24-72 hours of self-reliant energy consumption with a 90% likelihood of ride through, the City may need to consider increasing capacity for the BESS and/or solar PV system, however each critical facility may have unique limitations for additional onsite generation. For the four priority sites identified, microgrid designs will be further evaluated in **Part II: Microgrid Financial Modeling** to prepare the City for a design-build procurement approach for a portfolio of critical facility sites.

[30] https://www.cityoflancasterca.org/our-city/about-us/advanced-energy-community

PART II

MICROGRID FINANCIAL MODELING

INTRODUCTION

The City's high-priority facilities, as identified and confirmed by the City during the microgrid facilities screening, were determined to be the City Hall Campus, Corporation Yard, Community and Recreation Center, and Susi Q Center facilities. **Part II: Microgrid Financial Modeling** develops comprehensive economic projections to prepare the City for a design-build procurement approach for a portfolio of these four critical facility sites.

Following the operational modeling, Optony analyzed the potential financial benefits of microgrid installations at each specific site. This analysis relied on key financial inputs such as facility rate schedule, applicable solar/storage interconnection tariffs, and relevant incentives such as federal tax grants. Optony considered revenue streams, such as renewable energy self-consumption, energy arbitrage, demand charge mitigation, and wholesale market revenues, such as resource adequacy and demand response. Based on the system architecture defined in **Part I: General Microgrid Operational Study and Guidance**, Optony incorporated a minimum state of charge maintained for resilience, ensuring that we are accurately modeling the financial benefits while prioritizing resilience. Optony determined the exact minimum state of charge in consultation with City staff and based on the resilience duration probabilities for 24 hours, 48 hours, and 72 hours of self-reliant energy consumption with a 90% likelihood of ride-through. After determining the appropriate mix of revenue streams, Optony modeled 25-year cash flows associated with the microgrid under a cash purchase, PPA, and microgrid services agreement.

FINANCIAL MODELING METHODOLOGY

OWNERSHIP STRUCTURES

A high-level description of each applicable financial structure is provided below. These descriptions provide useful background for the financial analysis presented and can be used by the City to inform consideration of future projects. In general, the Direct Purchase financing structure provides the greatest long-term savings for entities eligible for incentives but in turn requires a significant initial project investment and ongoing operations and maintenance (O&M) associated costs for the lifespan of the systems. A third-party ownership option typically provides the greatest savings for tax-exempt entities and is thus appealing for local governments, but the expansion of entities eligible for the Investment Tax Credit (ITC) as part of the Inflation Reduction Act (IRA) of 2022 makes cash purchase typically more desirable.

DIRECT PURCHASE

The City would use existing cash reserves, grant funding, or a loan to purchase the system outright. Under this scenario, the site owner is responsible for all ownership concerns, including O&M, regular system cleaning, insurance, and monitoring of system production. This requires a significant up-front capital expenditure and on-going operational costs but can often result in higher total savings than other ownership and financing structures. Usually, public agencies cannot take advantage of tax credit benefits, but the recently passed IRA is an exception for both solar and storage installations and extends eligibility of the ITC.

THIRD-PARTY OWNERSHIP – POWER PURCHASE AGREEMENT

Under third-party ownership, the City would enter into a contract of typically 20 years with a third-party to purchase all energy produced by a solar PV system installed on the property in question. This third-party would own the solar PV system and be fully responsible for all ownership costs, including financing, O&M, insurance, and system output. This structure enables site owners to receive electricity from a solar PV system at no upfront costs and allows the tax incentives (i.e., ITC) for solar installations to be monetized by the third party.

The site host pays a fixed rate for the electricity produced by the solar array for the duration of the contract. In PPAs that include a storage system, the simplest approach is to spread the additional cost of the storage system across the energy produced by the solar array and discharged by the battery and increase the fixed rate for electricity. PPAs typically include a yearly price escalator between 0-3%. The value of this escalator relative to the rate at which utility prices increase will affect the savings in future years. Monthly payments may be lower than current or projected utility bills starting on day one, resulting in immediate savings. It is important to note that, if the City moves forward with a project, final pricing will be offered by developers and are subject to the assumptions utilized in the analysis.

INCENTIVES

As part of the recently passed IRA, the City is anticipated to be eligible for the full ITC base amount.[31] Elective pay allows entities, including tax-exempt and governmental entities, the ability to benefit from clean energy tax credits. By choosing this election, the amount of the credit is treated as a payment of tax. If the City makes a clean energy investment that qualifies for this investment tax credit, it can file an annual tax return with the IRS to claim elective pay for the full value of the investment tax credit. The ITC is a federal tax credit for up to 30% of project costs (including but not limited to roofing work for the solar PV, material costs, construction costs, etc.) that allows for significant cash-flow benefits and can lead to lower pricing for the installation of solar PV and battery energy storage via a direct reimbursement from the Internal Revenue Service (IRS). There are also additional bonus credit programs, including but not limited to utilizing domestic content on projects as well as being located in energy communities or areas which have the potential to increase the base ITC amount 10%-20% per bonus program. The high-priority sites assessed for the City of Laguna Beach do not qualify for the Low-Income Communities bonus amounts, but possibly qualify for the Energy Communities bonus, according to IRS maps available in December 2023. The City could potentially qualify for the Domestic Content bonus, but eligibility depends on the technology or materials used in the project. The energy storage configuration in this analysis assumes that the battery is restricted to only charging from onsite solar energy and therefore is eligible to claim the full 100% ITC value. It is important to be aware of the time-sensitive nature of this tax credit, which is scheduled to step down beginning 2033.

[31] https://www.irs.gov/pub/irs-pdf/p5817e.pdf

FINANCIAL MODELING RESULTS

Among facility reliability options, a BESS is a more beneficial option than a diesel generator because, in addition to significantly lowering GHG emissions, the BESS can also operate to reduce utility demand (power needed instantaneously from the electrical grid) and can shift energy needs from higher-priced periods of the day to lower-priced periods, through energy arbitrage. In many cases, the electrical bill savings from demand shaving and energy arbitrage can produce a compelling payback period for BESS.

With the consideration of different SCE tariffs, the City would experience further bill savings in the form of reduced energy and demand charges by voluntarily switching from the current rate schedules on all four facilities (a total of five service meters) to TOU-GS-2-E or TOU-GS-3-E. Below is an explanation of the differences between rate options and why switching rates could be beneficial when installing a solar PV and/or battery system:

TOU-GS-D:

1. Under TOU-GS-D, the pricing structure typically includes higher rates during peak hours (usually in the late afternoon and early evening) and lower rates during off-peak hours (typically late at night and early morning).
2. This option may be suitable for facilities with energy usage patterns that align with peak solar generation hours or when electricity demand is generally lower.
3. With a solar PV system, facilities can generate electricity during peak sunlight hours, potentially offsetting the need to purchase electricity at higher rates during peak periods. However, if energy consumption remains high during peak hours (e.g., due to air conditioning usage), the savings may be limited.

TOU-GS-E:

1. TOU-GS-E typically offers a different pricing structure compared to TOU-GS-D, with variations in peak/off-peak periods and rates.
2. This option might have peak hours that extend into the evening when solar generation is declining but household energy usage remains high.
3. For facilities with solar PV systems, TOU-GS-E could be beneficial if it offers more favorable rates during peak periods when solar production may be lower, but facility consumption remains high. It allows facilities to offset higher electricity costs during these peak periods with energy generated during off-peak hours or stored in batteries.

Benefits of Switching Rates with Solar PV and/or Battery Installation:

1. Maximizing Solar Savings: By switching to a TOU rate option that aligns peak pricing with solar generation patterns, facilities can maximize their savings by using solar energy to offset higher-priced grid electricity during peak periods.

2. Optimizing Self-Consumption: Some TOU rate options may incentivize greater self-consumption of solar energy by offering more favorable rates during peak hours when solar production is highest. This can reduce reliance on grid electricity and increase the overall financial benefits of solar PV systems.
3. Increasing Energy Independence: Switching to a TOU rate option that encourages energy storage or consumption during off-peak hours can enhance energy independence and resilience, especially when paired with battery storage systems. This allows facilities to utilize stored solar energy during peak periods or when grid electricity prices are highest.
4. Tailoring to Consumption Patterns: Choosing the right TOU rate option allows facilities to align their energy consumption patterns with the pricing structure, optimizing savings based on their specific usage habits and solar generation capabilities.

There is widespread anticipation that grants from state and federal sources will become available in the near future, enabling the City's resilience goals to be met through over-arching infrastructure hardening, rather than having to be met through localized spending from the City's general fund. Additionally, the federal government's Investment Tax Credit could enable 30% or more of the future costs of a BESS installation to be compensated back to the City or credited to a future developer.

The tables in **Appendix A Financial Results** display a representation of estimated current and new electric bills for the City Hall Campus, Corporation Yard, Laguna Beach Community and Recreation Center, and Susi Q Center facilities after the installation of a PV and BESS microgrid, followed by a cost-benefit analysis for the battery specifically. Note that these tables include future estimated energy load based on EV charging infrastructure, if indicated in the operational modeling. The analysis is based on the most current rates (updated October 1, 2023) under the facility’s existing SCE commercial tariffs, given as TOU-GS-2-D, and potential switch to TOU-GS-2-E and TOU-GS-3-E, depending on maximum demand.

CONCLUSION

To meet the community-wide goal of carbon neutrality at critical municipal facilities, Optony's feasibility study has produced the following results for solar photovoltaic (PV) and battery energy storage system (BESS) microgrids at the City Hall Campus, Corporation Yard, Community and Recreation Center, and Susi Q Center facilities. The information contained in this report is intended to support City decision-makers in determining the most suitable size, combination, and configuration of solar PV and BESS microgrid technologies appropriate for converting critical facilities to resilient, self-sufficient microgrids. At each site, the space available for solar PV and BESS is limited due to factors such as available parking areas, roof type and age, parcel size, flow of traffic for large emergency apparatuses or specialized trolley vehicles, etc. For two of the sites, 100% of current and future estimated electricity consumption can be met with a solar PV rooftop and/or carport system, but the critical nature of all these facilities plays a key factor in Optony's recommendation for battery storage and PV-coupled microgrids. The City must decide which, if not all, critical facilities to pursue a microgrid portfolio approach to balance the financial costs, savings, and overall resiliency benefits. Recommended microgrid sizes for all high-priority facilities are included below.

TABLE 11: HIGH-PRIORITY FACILITIES RECOMMENDED MICROGRID SIZE

Municipal Facilities Near-term Microgrid Sites					
Scenarios	**City Hall Campus**		**Corporation Yard**	**Recreation Center (Assumes Load-Shedding)**	**Susi Q Center**
	City Hall	**Lift Station**			
PV Size	386 kW-DC	67 kW-DC	185 kW-DC	246 kW-DC	48 kW-DC
BESS Duration	5 hours @ 220 kW	6 hours @ 53 kW	3 hours @ 248 kW	9 hours @ 186 kW	10 hours @ 93 kW
24-hr Resilience	90%	90%	90%	97%	90%
48-hr Resilience	67%	79%	71%	90%	35%
72-hr Resilience	55%	72%	60%	77%	25%
Est. PV+BESS Cost[33]	$2,907,000	$662,100	$1,559,400	$3,332,700	$1,566,900
25-Yr Utility Savings[35]	$4,486,200	$882,800	$2,520,400	$3,039,100	$797,100
Payback Period[36]	Year 15	Year 16	Year 14	Year 22	> Year 25

Portfolio Results (All Sites Combined)	
Total PV	932 kW
Total BESS (Recommended)	4,450 kWh – 10,171 kWh (800 kW / 4,822 kWh)
Lifetime 25-Yr Total Net-Savings[32] (Includes Total Project Costs)	$7,540,100 @24 hrs
	$10,666,800 @48 hrs
	$13,548,100 @72 hrs
Up-Front Development Capital Cost[34] (Applies To Direct Purchase Option Only)	$9,470,100 @24 hrs
	$13,936,800 @48 hrs
	$18,053,100 @72 hrs

[32] **Lifetime 25-Yr Total Net-Savings** is the accumulation of the estimated project savings, including electricity savings, reduced by PV and BESS project and maintenance costs, and offset by ITC savings, for each respective resilience scenario.

[33] **Est. PV + BESS Cost** is the estimated upfront capital project cost of the recommended microgrid system, not including maintenance costs, electricity savings, or ITC savings.

[34] **Up-Front Development Capital Cost** is the estimated immediate PV and BESS project costs for each respective resilience scenario.

[35] **25-Yr Utility Savings** is the estimated electricity savings the City may receive from the recommended microgrid system.

[36] **Payback Period** is the projected year which the recommended microgrid system would result in positive savings for the City.

From a holistic perspective, the total net project savings across all four high-priority facilities is estimated at approximately $3.8M over the course of the 25-year term, balancing out the costs of installation ($10M) and O&M/inverter replacement ($0.9M) with federal funding ($3M) and estimated electricity savings ($11.7M).

A BESS can be used to meet most, or all, of the resilience needs of each site, although SCE will limit the capacity of the BESS to meet current demand of the site, unless the City attests to future demand. For City Hall and the Corporation Yard, microgrids have been sized to future anticipated load of EV charging. In addition, the maximum available electrical capacity limits the combined on-site generation, including both PV and BESS capacity, despite neither component producing independently at full capacity, unless the City chooses to pursue a potentially costly service upgrade. The City should consider that BESS has benefits over existing generators at City Hall and the Corporation Yard because the BESS can be used to reduce utility demand charges as well as electricity costs during peak times, whereas the generator is only used during utility outages. In anticipation of future Public Safety Power Shutoff (PSPS) events and worsening natural disasters, the proposed 386 kW-DC PV size with a 220 kW / 1,166 kWh BESS microgrid would provide 24 hours' worth of noninterrupted back-up power to the main City Hall building with a 90% likelihood of resilience throughout the year.

Based on the critical resilience factor as well as guidance from City staff, Optony recommends proceeding with a combined procurement package for the design and installation of solar and battery microgrids at all four high-priority sites (e.g., the City Hall Campus, Corporation Yard, Community and Recreation Center, and Susi Q Center facilities). The majority of facilities, with the exception of minimal available space at the Susi Q Center, provide a significant net present value (NPV), which offsets the capital investment of installing solar and battery at Susi Q Center and still allows the City to have a positive NPV from an overall view of the sites as a whole. Since future BESS would benefit all sites and the City as an entity from an environmental, resilience, and gross financial perspective, the City should plan to submit applications for any and all current and future external funding opportunities to assist with further offsetting the total project cost. The projected timeline for the City's microgrid installation process is visualized below.

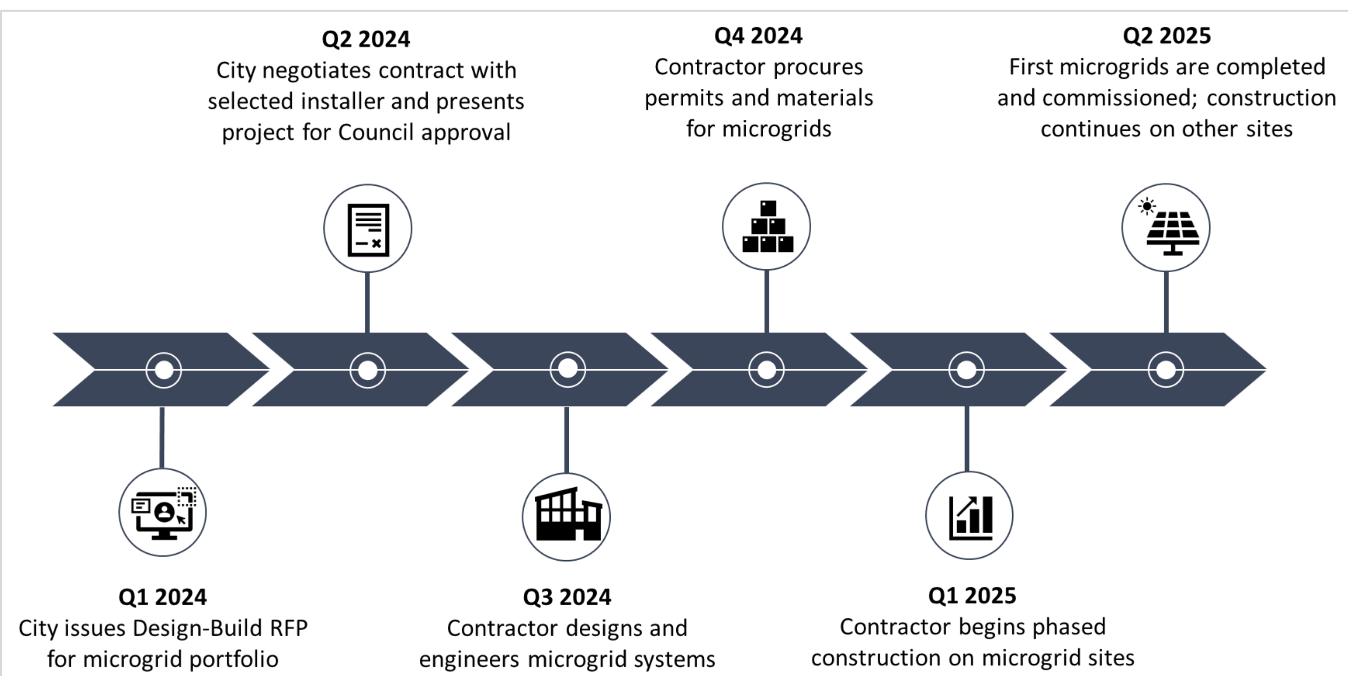

FIGURE 25: PROJECTED TIMELINE FOR CITY MICROGRID INSTALLATION PROCESS

APPENDIX A

FINANCIAL RESULTS

APPENDIX A: FINANCIAL RESULTS

The detailed results of the Financial Modeling are included below for the 24-hour, 48-hour, and 72-hour resiliency scenarios with a 90% likelihood of ride-through for each high-priority site.

TABLE 12: CURRENT CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	10,367	18,377	21,572	-	147	$6,319	$4,531	$318	$11,168
February	Winter	-	9,652	17,097	20,072	-	143	$5,880	$4,414	$309	$10,603
March	Winter	-	10,298	18,541	22,222	-	188	$6,396	$5,799	$320	$12,514
April	Winter	-	10,351	17,622	20,032	-	165	$6,057	$5,106	$312	$11,475
May	Winter	-	11,557	18,572	22,285	-	159	$6,592	$4,909	$323	$11,824
June	Summer	8,672	2,829	41,549	-	156	-	$7,728	$9,857	$325	$17,910
July	Summer	9,399	4,028	47,105	-	195	-	$8,826	$12,328	$344	$21,498
August	Summer	10,365	3,088	49,610	-	169	-	$9,177	$10,706	$350	$20,233
September	Summer	9,702	3,257	47,939	-	179	-	$8,855	$11,314	$345	$20,515
October	Winter	-	12,156	20,260	24,569	-	153	$7,150	$4,729	$335	$12,214
November	Winter	-	10,210	17,256	20,274	-	159	$6,005	$4,909	$311	$11,225
December	Winter	-	11,090	18,964	21,704	-	189	$6,525	$5,836	$321	$12,682
Total		**38,138**	**98,881**	**332,893**	**172,730**	**698**	**1,302**	**$85,510**	**$84,438**	**$3,913**	**$173,861**

TABLE 13: CURRENT CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	2,563	3,547	4,297	-	43	$1,316	$1,335	$216	$2,867
February	Winter	-	2,347	4,124	3,712	-	43	$1,312	$1,335	$215	$2,862
March	Winter	-	2,707	4,482	4,834	-	38	$1,526	$1,187	$220	$2,933
April	Winter	-	2,356	4,218	4,659	-	38	$1,419	$1,187	$218	$2,823
May	Winter	-	2,375	3,415	4,314	-	34	$1,270	$1,039	$215	$2,523
June	Summer	1,717	583	6,094	-	34	-	$1,252	$2,129	$210	$3,591
July	Summer	1,584	878	5,564	-	34	-	$1,210	$2,129	$210	$3,548
August	Summer	1,951	874	5,278	-	38	-	$1,244	$2,433	$210	$3,886
September	Summer	1,373	516	5,378	-	34	-	$1,077	$2,129	$208	$3,413
October	Winter	-	1,663	1,609	3,470	-	29	$818	$890	$206	$1,914
November	Winter	-	1,976	3,028	3,696	-	38	$1,094	$1,187	$211	$2,493
December	Winter	-	2,371	3,607	4,309	-	43	$1,297	$1,335	$215	$2,848
Total		**6,625**	**21,210**	**50,344**	**33,291**	**139**	**307**	**$14,835**	**$18,314**	**$2,553**	**$35,702**

TABLE 14: CURRENT CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	5,789	9,479	10,914	-	172	$3,304	$5,329	$256	$8,889
February	Winter	-	4,965	8,692	10,176	-	147	$2,995	$4,556	$250	$7,801
March	Winter	-	4,878	9,123	11,823	-	119	$3,205	$3,684	$255	$7,144
April	Winter	-	4,790	8,069	11,518	-	191	$3,007	$5,904	$251	$9,163
May	Winter	-	4,964	7,299	11,160	-	176	$2,885	$5,446	$249	$8,581
June	Summer	3,578	1,069	18,324	-	172	-	$3,327	$10,922	$248	$14,496
July	Summer	3,764	1,442	19,373	-	113	-	$3,571	$7,184	$252	$11,006
August	Summer	4,306	1,148	19,537	-	151	-	$3,646	$9,541	$253	$13,439
September	Summer	4,257	1,282	20,430	-	113	-	$3,779	$7,184	$255	$11,218
October	Winter	-	5,021	7,995	10,763	-	119	$2,958	$3,684	$250	$6,892
November	Winter	-	5,477	8,353	11,767	-	172	$3,175	$5,329	$255	$8,758
December	Winter	-	5,167	8,975	10,963	-	97	$3,143	$3,011	$253	$6,407
Total		**15,905**	**45,991**	**145,650**	**89,085**	**550**	**1,195**	**$38,994**	**$71,773**	**$3,027**	**$113,795**

TABLE 15: CURRENT RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	8,510	11,288	15,517	-	112	$5,170	$1,748	$279	$7,198
February	Winter	-	7,734	10,566	14,040	-	99	$4,737	$1,549	$272	$6,557
March	Winter	-	8,604	12,191	16,158	-	96	$5,391	$1,499	$284	$7,173
April	Winter	-	8,386	11,492	15,733	-	96	$5,195	$1,499	$280	$6,974
May	Winter	-	9,358	12,864	17,708	-	102	$5,820	$1,598	$291	$7,709
June	Summer	7,295	2,545	29,883	-	106	-	$13,403	$2,168	$291	$15,862
July	Summer	10,218	4,774	41,640	-	131	-	$19,136	$2,694	$334	$22,164
August	Summer	11,719	3,622	46,330	-	138	-	$21,024	$2,825	$347	$24,196
September	Summer	11,754	3,775	49,823	-	150	-	$21,835	$3,088	$356	$25,279
October	Winter	-	12,056	16,926	23,006	-	122	$7,570	$1,898	$322	$9,790
November	Winter	-	8,842	13,099	16,451	-	125	$5,607	$1,948	$287	$7,842
December	Winter	-	8,221	12,493	14,535	-	86	$5,177	$1,349	$279	$6,805
Total		**40,986**	**86,426**	**268,596**	**133,148**	**525**	**838**	**$120,065**	**$23,862**	**$3,622**	**$147,549**

TABLE 16: CURRENT SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	**Season**	**On-Peak**	**Mid-Peak**	**Off-Peak**	**Super Off-Peak**	**On-Peak**	**Mid-Peak**	**Energy**	**Demand**	**Non-Bypassable**	**Total**
January	Winter	-	4,255	5,644	7,758	-	56	$2,208	$1,731	$234	$4,174
February	Winter	-	3,867	5,283	7,020	-	50	$2,027	$1,533	$230	$3,790
March	Winter	-	4,302	6,096	8,079	-	48	$2,313	$1,484	$236	$4,033
April	Winter	-	4,193	5,746	7,866	-	48	$2,225	$1,484	$235	$3,943
May	Winter	-	4,679	6,432	8,854	-	51	$2,493	$1,583	$240	$4,315
June	Summer	3,648	1,272	14,942	-	53	-	$2,930	$3,345	$240	$6,515
July	Summer	5,109	2,387	20,820	-	66	-	$4,201	$4,156	$261	$8,618
August	Summer	5,860	1,811	23,165	-	69	-	$4,554	$4,358	$268	$9,181
September	Summer	5,877	1,888	24,912	-	75	-	$4,803	$4,764	$273	$9,839
October	Winter	-	6,028	8,463	11,503	-	61	$3,247	$1,879	$256	$5,382
November	Winter	-	4,421	6,550	8,226	-	62	$2,411	$1,929	$238	$4,578
December	Winter	-	4,110	6,246	7,268	-	43	$2,228	$1,335	$234	$3,798
Total		**20,493**	**43,213**	**134,298**	**66,574**	**262**	**419**	**$35,640**	**$29,581**	**$2,945**	**$68,165**

TABLE 17: NEW CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	6,194	13,713	2,632	-	40	$3,066	$651	$593	$4,310
February	Winter	-	5,352	12,562	2,786	-	41	$2,751	$662	$589	$4,002
March	Winter	-	4,593	11,385	1,301	-	34	$2,025	$551	$582	$3,158
April	Winter	-	3,560	9,236	613	-	30	$1,682	$483	$574	$2,739
May	Winter	-	3,783	9,857	686	-	31	$1,662	$497	$576	$2,734
June	Summer	2,726	972	12,415	-	33	-	$1,460	$2,090	$230	$3,781
July	Summer	2,830	1,329	12,666	-	36	-	$1,251	$2,255	$232	$3,738
August	Summer	3,606	1,190	13,383	-	37	-	$1,325	$2,374	$236	$3,934
September	Summer	4,242	1,434	14,360	-	41	-	$3,078	$2,600	$240	$5,919
October	Winter	-	6,176	13,326	1,441	-	40	$2,550	$649	$590	$3,788
November	Winter	-	5,797	12,607	1,972	-	39	$2,690	$624	$589	$3,903
December	Winter	-	6,916	15,183	3,816	-	77	$3,658	$1,240	$601	$5,499
Total		**13,404**	**47,295**	**150,692**	**15,247**	**147**	**332**	**$27,198**	**$14,676**	**$5,632**	**$47,506**

TABLE 18: NEW CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	1,433	2,840	900	-	34	$743	$524	$202	$1,470
February	Winter	-	1,277	2,944	739	-	38	$715	$599	$202	$1,516
March	Winter	-	1,208	2,756	504	-	9	$635	$143	$200	$978
April	Winter	-	954	2,242	253	-	8	$503	$122	$198	$823
May	Winter	-	783	1,786	198	-	6	$353	$99	$196	$649
June	Summer	516	177	1,798	-	6	-	$198	$385	$195	$778
July	Summer	382	207	1,463	-	5	-	-$52	$323	$194	$465
August	Summer	432	172	1,325	-	5	-	-$164	$306	$194	$336
September	Summer	404	157	1,261	-	4	-	$106	$276	$194	$576
October	Winter	-	557	1,052	81	-	4	$77	$61	$193	$331
November	Winter	-	977	2,047	401	-	7	$469	$111	$198	$778
December	Winter	-	1,495	2,977	982	-	38	$793	$599	$203	$1,595
Total		**1,735**	**9,397**	**24,493**	**4,058**	**20**	**145**	**$4,377**	**$3,549**	**$2,369**	**$10,295**

TABLE 19: NEW CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	**Season**	**On-Peak**	**Mid-Peak**	**Off-Peak**	**Super Off-Peak**	**On-Peak**	**Mid-Peak**	**Energy**	**Demand**	**Non-Bypassable**	**Total**
January	Winter	-	3,646	7,904	1,722	-	123	$1,825	$1,989	$573	$4,387
February	Winter	-	2,875	6,666	1,554	-	104	$1,499	$1,674	$569	$3,741
March	Winter	-	2,272	5,656	810	-	18	$1,089	$283	$563	$1,936
April	Winter	-	1,713	4,427	471	-	15	$861	$243	$559	$1,663
May	Winter	-	1,609	4,173	447	-	14	$688	$223	$558	$1,469
June	Summer	1,058	361	4,630	-	14	-	$423	$866	$204	$1,493
July	Summer	1,117	460	5,073	-	14	-	$224	$916	$206	$1,346
August	Summer	1,526	458	5,223	-	85	-	$136	$5,397	$207	$5,741
September	Summer	1,734	554	5,874	-	17	-	$1,133	$1,103	$210	$2,445
October	Winter	-	2,444	5,412	789	-	17	$905	$278	$563	$1,746
November	Winter	-	3,161	6,931	1,727	-	22	$1,580	$361	$570	$2,511
December	Winter	-	3,477	7,516	2,340	-	57	$1,860	$921	$573	$3,354
Total		**5,435**	**23,029**	**69,485**	**9,859**	**131**	**370**	**$12,223**	**$14,252**	**$5,356**	**$31,831**

TABLE 20: NEW RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	**Season**	**On-Peak**	**Mid-Peak**	**Off-Peak**	**Super Off-Peak**	**On-Peak**	**Mid-Peak**	**Energy**	**Demand**	**Non-Bypassable**	**Total**
January	Winter	-	4,317	8,955	2,003	-	28	$2,146	$450	$578	$3,174
February	Winter	-	3,747	8,205	1,931	-	28	$1,898	$453	$575	$2,926
March	Winter	-	3,421	8,182	1,107	-	25	$1,613	$405	$572	$2,590
April	Winter	-	2,674	6,608	569	-	22	$1,323	$350	$566	$2,239
May	Winter	-	3,051	7,449	798	-	24	$1,469	$381	$569	$2,420
June	Summer	2,249	836	9,053	-	25	-	$3,211	$518	$220	$3,949
July	Summer	3,170	1,507	11,655	-	34	-	$4,980	$694	$231	$5,904
August	Summer	4,278	1,459	13,827	-	40	-	$6,373	$830	$239	$7,442
September	Summer	5,436	1,865	18,619	-	50	-	$8,945	$1,021	$255	$10,221
October	Winter	-	5,929	11,765	2,581	-	39	$2,988	$622	$589	$4,199
November	Winter	-	4,782	9,925	2,209	-	32	$2,441	$515	$581	$3,538
December	Winter	-	4,675	9,704	2,502	-	30	$2,430	$488	$581	$3,499
Total		**15,133**	**38,265**	**123,947**	**13,700**	**149**	**227**	**$39,817**	**$6,728**	**$5,555**	**$52,100**

TABLE 21: NEW SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	**Season**	**On-Peak**	**Mid-Peak**	**Off-Peak**	**Super Off-Peak**	**On-Peak**	**Mid-Peak**	**Energy**	**Demand**	**Non-Bypassable**	**Total**
January	Winter	-	2,671	5,122	2,985	-	17	$1,650	$270	$217	$2,136
February	Winter	-	2,402	4,696	2,565	-	17	$1,485	$269	$214	$1,968
March	Winter	-	2,412	4,879	2,049	-	16	$1,456	$244	$213	$1,913
April	Winter	-	2,099	4,246	1,576	-	14	$1,244	$220	$209	$1,673
May	Winter	-	2,464	4,908	2,070	-	16	$1,472	$251	$213	$1,936
June	Summer	1,937	681	7,508	-	38	-	$2,090	$2,433	$215	$4,737
July	Summer	3,834	1,817	12,615	-	39	-	$3,919	$2,502	$236	$6,656
August	Summer	4,935	1,610	15,177	-	45	-	$4,772	$2,852	$245	$7,868
September	Summer	5,318	1,719	17,569	-	52	-	$5,304	$3,316	$252	$8,872
October	Winter	-	5,388	8,013	5,336	-	39	$2,915	$611	$237	$3,763
November	Winter	-	2,979	5,902	3,378	-	20	$1,874	$311	$220	$2,405
December	Winter	-	2,766	5,510	3,039	-	18	$1,733	$280	$218	$2,231
Total		**16,024**	**29,006**	**96,145**	**22,999**	**175**	**157**	**$29,913**	**$13,558**	**$2,688**	**$46,160**

TABLE 22: CURRENT CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	10,367	18,377	21,572	-	147	$6,319	$4,531	$318	$11,168
February	Winter	-	9,652	17,097	20,072	-	143	$5,880	$4,414	$309	$10,603
March	Winter	-	10,298	18,541	22,222	-	188	$6,396	$5,799	$320	$12,514
April	Winter	-	10,351	17,622	20,032	-	165	$6,057	$5,106	$312	$11,475
May	Winter	-	11,557	18,572	22,285	-	159	$6,592	$4,909	$323	$11,824
June	Summer	8,672	2,829	41,549	-	156	-	$7,728	$9,857	$325	$17,910
July	Summer	9,399	4,028	47,105	-	195	-	$8,826	$12,328	$344	$21,498
August	Summer	10,365	3,088	49,610	-	169	-	$9,177	$10,706	$350	$20,233
September	Summer	9,702	3,257	47,939	-	179	-	$8,855	$11,314	$345	$20,515
October	Winter	-	12,156	20,260	24,569	-	153	$7,150	$4,729	$335	$12,214
November	Winter	-	10,210	17,256	20,274	-	159	$6,005	$4,909	$311	$11,225
December	Winter	-	11,090	18,964	21,704	-	189	$6,525	$5,836	$321	$12,682
Total		**38,138**	**98,881**	**332,893**	**172,730**	**698**	**1,302**	**$85,510**	**$84,438**	**$3,913**	**$173,861**

TABLE 23: CURRENT CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	2,563	3,547	4,297	-	43	$1,316	$1,335	$216	$2,867
February	Winter	-	2,347	4,124	3,712	-	43	$1,312	$1,335	$215	$2,862
March	Winter	-	2,707	4,482	4,834	-	38	$1,526	$1,187	$220	$2,933
April	Winter	-	2,356	4,218	4,659	-	38	$1,419	$1,187	$218	$2,823
May	Winter	-	2,375	3,415	4,314	-	34	$1,270	$1,039	$215	$2,523
June	Summer	1,717	583	6,094	-	34	-	$1,252	$2,129	$210	$3,591
July	Summer	1,584	878	5,564	-	34	-	$1,210	$2,129	$210	$3,548
August	Summer	1,951	874	5,278	-	38	-	$1,244	$2,433	$210	$3,886
September	Summer	1,373	516	5,378	-	34	-	$1,077	$2,129	$208	$3,413
October	Winter	-	1,663	1,609	3,470	-	29	$818	$890	$206	$1,914
November	Winter	-	1,976	3,028	3,696	-	38	$1,094	$1,187	$211	$2,493
December	Winter	-	2,371	3,607	4,309	-	43	$1,297	$1,335	$215	$2,848
Total		**6,625**	**21,210**	**50,344**	**33,291**	**139**	**307**	**$14,835**	**$18,314**	**$2,553**	**$35,702**

TABLE 24: CURRENT CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	5,789	9,479	10,914	-	172	$3,304	$5,329	$256	$8,889
February	Winter	-	4,965	8,692	10,176	-	147	$2,995	$4,556	$250	$7,801
March	Winter	-	4,878	9,123	11,823	-	119	$3,205	$3,684	$255	$7,144
April	Winter	-	4,790	8,069	11,518	-	191	$3,007	$5,904	$251	$9,163
May	Winter	-	4,964	7,299	11,160	-	176	$2,885	$5,446	$249	$8,581
June	Summer	3,578	1,069	18,324	-	172	-	$3,327	$10,922	$248	$14,496
July	Summer	3,764	1,442	19,373	-	113	-	$3,571	$7,184	$252	$11,006
August	Summer	4,306	1,148	19,537	-	151	-	$3,646	$9,541	$253	$13,439
September	Summer	4,257	1,282	20,430	-	113	-	$3,779	$7,184	$255	$11,218
October	Winter	-	5,021	7,995	10,763	-	119	$2,958	$3,684	$250	$6,892
November	Winter	-	5,477	8,353	11,767	-	172	$3,175	$5,329	$255	$8,758
December	Winter	-	5,167	8,975	10,963	-	97	$3,143	$3,011	$253	$6,407
Total		**15,905**	**45,991**	**145,650**	**89,085**	**550**	**1,195**	**$38,994**	**$71,773**	**$3,027**	**$113,795**

TABLE 25: CURRENT RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	8,510	11,288	15,517	-	112	$5,170	$1,748	$279	$7,198
February	Winter	-	7,734	10,566	14,040	-	99	$4,737	$1,549	$272	$6,557
March	Winter	-	8,604	12,191	16,158	-	96	$5,391	$1,499	$284	$7,173
April	Winter	-	8,386	11,492	15,733	-	96	$5,195	$1,499	$280	$6,974
May	Winter	-	9,358	12,864	17,708	-	102	$5,820	$1,598	$291	$7,709
June	Summer	7,295	2,545	29,883	-	106	-	$13,403	$2,168	$291	$15,862
July	Summer	10,218	4,774	41,640	-	131	-	$19,136	$2,694	$334	$22,164
August	Summer	11,719	3,622	46,330	-	138	-	$21,024	$2,825	$347	$24,196
September	Summer	11,754	3,775	49,823	-	150	-	$21,835	$3,088	$356	$25,279
October	Winter	-	12,056	16,926	23,006	-	122	$7,570	$1,898	$322	$9,790
November	Winter	-	8,842	13,099	16,451	-	125	$5,607	$1,948	$287	$7,842
December	Winter	-	8,221	12,493	14,535	-	86	$5,177	$1,349	$279	$6,805
Total		**40,986**	**86,426**	**268,596**	**133,148**	**525**	**838**	**$120,065**	**$23,862**	**$3,622**	**$147,549**

TABLE 26: CURRENT SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	4,255	5,644	7,758	-	56	$2,208	$1,731	$234	$4,174
February	Winter	-	3,867	5,283	7,020	-	50	$2,027	$1,533	$230	$3,790
March	Winter	-	4,302	6,096	8,079	-	48	$2,313	$1,484	$236	$4,033
April	Winter	-	4,193	5,746	7,866	-	48	$2,225	$1,484	$235	$3,943
May	Winter	-	4,679	6,432	8,854	-	51	$2,493	$1,583	$240	$4,315
June	Summer	3,648	1,272	14,942	-	53	-	$2,930	$3,345	$240	$6,515
July	Summer	5,109	2,387	20,820	-	66	-	$4,201	$4,156	$261	$8,618
August	Summer	5,860	1,811	23,165	-	69	-	$4,554	$4,358	$268	$9,181
September	Summer	5,877	1,888	24,912	-	75	-	$4,803	$4,764	$273	$9,839
October	Winter	-	6,028	8,463	11,503	-	61	$3,247	$1,879	$256	$5,382
November	Winter	-	4,421	6,550	8,226	-	62	$2,411	$1,929	$238	$4,578
December	Winter	-	4,110	6,246	7,268	-	43	$2,228	$1,335	$234	$3,798
Total		**20,493**	**43,213**	**134,298**	**66,574**	**262**	**419**	**$35,640**	**$29,581**	**$2,945**	**$68,165**

TABLE 27: NEW CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	6,194	13,713	2,632	-	40	$3,066	$651	$593	$4,310
February	Winter	-	5,352	12,562	2,786	-	41	$2,751	$662	$589	$4,002
March	Winter	-	4,593	11,385	1,301	-	34	$2,025	$551	$582	$3,158
April	Winter	-	3,560	9,236	613	-	30	$1,682	$483	$574	$2,739
May	Winter	-	3,783	9,857	686	-	31	$1,662	$497	$576	$2,734
June	Summer	2,726	972	11,741	-	33	-	$1,413	$2,090	$229	$3,732
July	Summer	2,830	1,329	12,666	-	36	-	$1,251	$2,255	$232	$3,738
August	Summer	3,606	1,190	13,383	-	37	-	$1,325	$2,374	$236	$3,934
September	Summer	4,242	1,434	14,360	-	41	-	$3,078	$2,600	$240	$5,919
October	Winter	-	6,176	13,326	1,441	-	40	$2,550	$649	$590	$3,788
November	Winter	-	5,797	12,607	1,972	-	39	$2,690	$624	$589	$3,903
December	Winter	-	6,864	15,029	3,669	-	44	$3,626	$716	$600	$4,942
Total		**13,404**	**47,243**	**149,864**	**15,101**	**147**	**299**	**$27,119**	**$14,152**	**$5,629**	**$46,900**

TABLE 28: NEW CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	1,360	2,613	786	-	34	$697	$524	$201	$1,423
February	Winter	-	1,204	2,747	643	-	10	$672	$156	$201	$1,029
March	Winter	-	1,208	2,663	503	-	9	$624	$143	$200	$967
April	Winter	-	954	2,242	253	-	8	$503	$122	$198	$823
May	Winter	-	783	1,786	198	-	6	$353	$99	$196	$649
June	Summer	516	177	1,798	-	6	-	$198	$385	$195	$778
July	Summer	382	207	1,463	-	5	-	-$52	$323	$194	$465
August	Summer	432	172	1,325	-	5	-	-$164	$306	$194	$336
September	Summer	404	157	1,261	-	4	-	$106	$276	$194	$576
October	Winter	-	557	1,052	81	-	4	$77	$61	$193	$331
November	Winter	-	979	1,857	412	-	7	$450	$111	$197	$758
December	Winter	-	1,348	2,694	944	-	38	$733	$599	$202	$1,534
Total		**1,735**	**9,106**	**23,502**	**3,820**	**20**	**116**	**$4,197**	**$3,106**	**$2,365**	**$9,669**

TABLE 29: NEW CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	3,359	7,804	1,744	-	76	$1,765	$1,221	$572	$3,559
February	Winter	-	2,797	6,594	1,425	-	22	$1,468	$358	$568	$2,394
March	Winter	-	2,272	5,656	810	-	18	$1,089	$283	$563	$1,936
April	Winter	-	1,713	4,427	471	-	15	$861	$243	$559	$1,663
May	Winter	-	1,609	4,173	447	-	14	$688	$223	$558	$1,469
June	Summer	1,058	361	4,599	-	14	-	$420	$866	$204	$1,490
July	Summer	1,117	460	4,994	-	14	-	$220	$916	$206	$1,341
August	Summer	1,395	458	5,135	-	15	-	$60	$976	$207	$1,243
September	Summer	1,734	554	5,889	-	17	-	$1,146	$1,103	$210	$2,458
October	Winter	-	2,444	5,412	789	-	17	$905	$278	$563	$1,746
November	Winter	-	3,161	6,931	1,727	-	22	$1,580	$361	$570	$2,511
December	Winter	-	3,410	7,511	2,050	-	23	$1,830	$368	$573	$2,771
Total		**5,304**	**22,597**	**69,125**	**9,462**	**61**	**207**	**$12,033**	**$7,195**	**$5,353**	**$24,581**

TABLE 30: NEW RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	4,317	8,955	2,003	-	28	$2,146	$450	$578	$3,174
February	Winter	-	3,747	8,205	1,931	-	28	$1,898	$453	$575	$2,926
March	Winter	-	3,421	8,182	1,107	-	25	$1,613	$405	$572	$2,590
April	Winter	-	2,674	6,608	569	-	22	$1,323	$350	$566	$2,239
May	Winter	-	3,051	7,449	798	-	24	$1,469	$381	$569	$2,420
June	Summer	2,249	836	9,053	-	25	-	$3,211	$518	$220	$3,949
July	Summer	3,170	1,507	11,582	-	34	-	$4,969	$694	$231	$5,893
August	Summer	4,278	1,459	13,631	-	40	-	$6,332	$830	$239	$7,401
September	Summer	5,436	1,873	17,896	-	50	-	$8,831	$1,021	$254	$10,106
October	Winter	-	5,929	11,765	2,581	-	39	$2,988	$622	$589	$4,199
November	Winter	-	4,782	9,925	2,209	-	32	$2,441	$515	$581	$3,538
December	Winter	-	4,675	9,704	2,502	-	30	$2,430	$488	$581	$3,499
Total		**15,133**	**38,272**	**122,955**	**13,700**	**149**	**227**	**$39,652**	**$6,728**	**$5,553**	**$51,932**

TABLE 31: NEW SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	2,671	5,122	2,985	-	17	$1,650	$270	$217	$2,136
February	Winter	-	2,402	4,696	2,565	-	17	$1,485	$269	$214	$1,968
March	Winter	-	2,412	4,879	2,049	-	16	$1,456	$244	$213	$1,913
April	Winter	-	2,099	4,246	1,576	-	14	$1,244	$220	$209	$1,673
May	Winter	-	2,464	4,908	2,070	-	16	$1,472	$251	$213	$1,936
June	Summer	1,870	681	7,436	-	17	-	$2,047	$1,101	$215	$3,362
July	Summer	3,834	1,817	12,648	-	39	-	$3,925	$2,502	$236	$6,662
August	Summer	4,935	1,610	15,177	-	45	-	$4,772	$2,852	$245	$7,868
September	Summer	5,318	1,719	17,569	-	52	-	$5,304	$3,316	$252	$8,872
October	Winter	-	5,388	8,013	5,336	-	39	$2,915	$611	$237	$3,763
November	Winter	-	2,979	5,902	3,378	-	20	$1,874	$311	$220	$2,405
December	Winter	-	2,766	5,510	3,039	-	18	$1,733	$280	$218	$2,231
Total		**15,958**	**29,006**	**96,106**	**22,999**	**154**	**157**	**$29,876**	**$12,226**	**$2,688**	**$44,791**

TABLE 32: CURRENT CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	10,367	18,377	21,572	-	147	$6,319	$4,531	$318	$11,168
February	Winter	-	9,652	17,097	20,072	-	143	$5,880	$4,414	$309	$10,603
March	Winter	-	10,298	18,541	22,222	-	188	$6,396	$5,799	$320	$12,514
April	Winter	-	10,351	17,622	20,032	-	165	$6,057	$5,106	$312	$11,475
May	Winter	-	11,557	18,572	22,285	-	159	$6,592	$4,909	$323	$11,824
June	Summer	8,672	2,829	41,549	-	156	-	$7,728	$9,857	$325	$17,910
July	Summer	9,399	4,028	47,105	-	195	-	$8,826	$12,328	$344	$21,498
August	Summer	10,365	3,088	49,610	-	169	-	$9,177	$10,706	$350	$20,233
September	Summer	9,702	3,257	47,939	-	179	-	$8,855	$11,314	$345	$20,515
October	Winter	-	12,156	20,260	24,569	-	153	$7,150	$4,729	$335	$12,214
November	Winter	-	10,210	17,256	20,274	-	159	$6,005	$4,909	$311	$11,225
December	Winter	-	11,090	18,964	21,704	-	189	$6,525	$5,836	$321	$12,682
Total		**38,138**	**98,881**	**332,893**	**172,730**	**698**	**1,302**	**$85,510**	**$84,438**	**$3,913**	**$173,861**

TABLE 33: CURRENT CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	2,563	3,547	4,297	-	43	$1,316	$1,335	$216	$2,867
February	Winter	-	2,347	4,124	3,712	-	43	$1,312	$1,335	$215	$2,862
March	Winter	-	2,707	4,482	4,834	-	38	$1,526	$1,187	$220	$2,933
April	Winter	-	2,356	4,218	4,659	-	38	$1,419	$1,187	$218	$2,823
May	Winter	-	2,375	3,415	4,314	-	34	$1,270	$1,039	$215	$2,523
June	Summer	1,717	583	6,094	-	34	-	$1,252	$2,129	$210	$3,591
July	Summer	1,584	878	5,564	-	34	-	$1,210	$2,129	$210	$3,548
August	Summer	1,951	874	5,278	-	38	-	$1,244	$2,433	$210	$3,886
September	Summer	1,373	516	5,378	-	34	-	$1,077	$2,129	$208	$3,413
October	Winter	-	1,663	1,609	3,470	-	29	$818	$890	$206	$1,914
November	Winter	-	1,976	3,028	3,696	-	38	$1,094	$1,187	$211	$2,493
December	Winter	-	2,371	3,607	4,309	-	43	$1,297	$1,335	$215	$2,848
Total		**6,625**	**21,210**	**50,344**	**33,291**	**139**	**307**	**$14,835**	**$18,314**	**$2,553**	**$35,702**

TABLE 34: CURRENT CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	5,789	9,479	10,914	-	172	$3,304	$5,329	$256	$8,889
February	Winter	-	4,965	8,692	10,176	-	147	$2,995	$4,556	$250	$7,801
March	Winter	-	4,878	9,123	11,823	-	119	$3,205	$3,684	$255	$7,144
April	Winter	-	4,790	8,069	11,518	-	191	$3,007	$5,904	$251	$9,163
May	Winter	-	4,964	7,299	11,160	-	176	$2,885	$5,446	$249	$8,581
June	Summer	3,578	1,069	18,324	-	172	-	$3,327	$10,922	$248	$14,496
July	Summer	3,764	1,442	19,373	-	113	-	$3,571	$7,184	$252	$11,006
August	Summer	4,306	1,148	19,537	-	151	-	$3,646	$9,541	$253	$13,439
September	Summer	4,257	1,282	20,430	-	113	-	$3,779	$7,184	$255	$11,218
October	Winter	-	5,021	7,995	10,763	-	119	$2,958	$3,684	$250	$6,892
November	Winter	-	5,477	8,353	11,767	-	172	$3,175	$5,329	$255	$8,758
December	Winter	-	5,167	8,975	10,963	-	97	$3,143	$3,011	$253	$6,407
Total		**15,905**	**45,991**	**145,650**	**89,085**	**550**	**1,195**	**$38,994**	**$71,773**	**$3,027**	**$113,795**

TABLE 35: CURRENT RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	8,510	11,288	15,517	-	112	$5,170	$1,748	$279	$7,198
February	Winter	-	7,734	10,566	14,040	-	99	$4,737	$1,549	$272	$6,557
March	Winter	-	8,604	12,191	16,158	-	96	$5,391	$1,499	$284	$7,173
April	Winter	-	8,386	11,492	15,733	-	96	$5,195	$1,499	$280	$6,974
May	Winter	-	9,358	12,864	17,708	-	102	$5,820	$1,598	$291	$7,709
June	Summer	7,295	2,545	29,883	-	106	-	$13,403	$2,168	$291	$15,862
July	Summer	10,218	4,774	41,640	-	131	-	$19,136	$2,694	$334	$22,164
August	Summer	11,719	3,622	46,330	-	138	-	$21,024	$2,825	$347	$24,196
September	Summer	11,754	3,775	49,823	-	150	-	$21,835	$3,088	$356	$25,279
October	Winter	-	12,056	16,926	23,006	-	122	$7,570	$1,898	$322	$9,790
November	Winter	-	8,842	13,099	16,451	-	125	$5,607	$1,948	$287	$7,842
December	Winter	-	8,221	12,493	14,535	-	86	$5,177	$1,349	$279	$6,805
Total		**40,986**	**86,426**	**268,596**	**133,148**	**525**	**838**	**$120,065**	**$23,862**	**$3,622**	**$147,549**

TABLE 36: CURRENT SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-D)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	4,255	5,644	7,758	-	56	$2,208	$1,731	$234	$4,174
February	Winter	-	3,867	5,283	7,020	-	50	$2,027	$1,533	$230	$3,790
March	Winter	-	4,302	6,096	8,079	-	48	$2,313	$1,484	$236	$4,033
April	Winter	-	4,193	5,746	7,866	-	48	$2,225	$1,484	$235	$3,943
May	Winter	-	4,679	6,432	8,854	-	51	$2,493	$1,583	$240	$4,315
June	Summer	3,648	1,272	14,942	-	53	-	$2,930	$3,345	$240	$6,515
July	Summer	5,109	2,387	20,820	-	66	-	$4,201	$4,156	$261	$8,618
August	Summer	5,860	1,811	23,165	-	69	-	$4,554	$4,358	$268	$9,181
September	Summer	5,877	1,888	24,912	-	75	-	$4,803	$4,764	$273	$9,839
October	Winter	-	6,028	8,463	11,503	-	61	$3,247	$1,879	$256	$5,382
November	Winter	-	4,421	6,550	8,226	-	62	$2,411	$1,929	$238	$4,578
December	Winter	-	4,110	6,246	7,268	-	43	$2,228	$1,335	$234	$3,798
Total		**20,493**	**43,213**	**134,298**	**66,574**	**262**	**419**	**$35,640**	**$29,581**	**$2,945**	**$68,165**

TABLE 37: NEW CITY HALL BUILDING + EV CHARGING ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	6,194	13,713	2,632	-	40	$3,066	$651	$593	$4,310
February	Winter	-	5,352	12,562	2,786	-	41	$2,751	$662	$589	$4,002
March	Winter	-	4,593	11,385	1,301	-	34	$2,025	$551	$582	$3,158
April	Winter	-	3,560	9,236	613	-	30	$1,682	$483	$574	$2,739
May	Winter	-	3,783	9,857	686	-	31	$1,662	$497	$576	$2,734
June	Summer	2,726	972	11,727	-	33	-	$1,412	$2,090	$228	$3,731
July	Summer	2,830	1,329	12,666	-	36	-	$1,251	$2,255	$232	$3,738
August	Summer	3,606	1,190	13,383	-	37	-	$1,325	$2,374	$236	$3,934
September	Summer	4,242	1,434	14,360	-	41	-	$3,078	$2,600	$240	$5,919
October	Winter	-	6,176	13,326	1,441	-	40	$2,550	$649	$590	$3,788
November	Winter	-	5,797	12,607	1,972	-	39	$2,690	$624	$589	$3,903
December	Winter	-	6,864	15,029	3,669	-	44	$3,626	$716	$600	$4,942
Total		**13,404**	**47,243**	**149,850**	**15,101**	**147**	**299**	**$27,118**	**$14,152**	**$5,629**	**$46,899**

TABLE 38: NEW CITY HALL LIFT STATION ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	1,273	2,542	774	-	9	$672	$142	$201	$1,015
February	Winter	-	1,204	2,638	638	-	10	$659	$156	$200	$1,015
March	Winter	-	1,208	2,663	503	-	9	$624	$143	$200	$967
April	Winter	-	954	2,242	253	-	8	$503	$122	$198	$823
May	Winter	-	783	1,786	198	-	6	$353	$99	$196	$649
June	Summer	516	177	1,798	-	6	-	$198	$385	$195	$778
July	Summer	382	207	1,463	-	5	-	-$52	$323	$194	$465
August	Summer	432	172	1,325	-	5	-	-$164	$306	$194	$336
September	Summer	404	157	1,261	-	4	-	$106	$276	$194	$576
October	Winter	-	557	1,052	81	-	4	$77	$61	$193	$331
November	Winter	-	979	1,854	407	-	7	$449	$111	$197	$757
December	Winter	-	1,276	2,590	953	-	34	$708	$524	$201	$1,434
Total		**1,735**	**8,947**	**23,215**	**3,806**	**20**	**87**	**$4,133**	**$2,649**	**$2,364**	**$9,147**

TABLE 39: NEW CORPORATION YARD ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	3,297	7,646	1,757	-	23	$1,740	$373	$572	$2,686
February	Winter	-	2,797	6,594	1,425	-	22	$1,468	$358	$568	$2,394
March	Winter	-	2,272	5,656	810	-	18	$1,089	$283	$563	$1,936
April	Winter	-	1,713	4,427	471	-	15	$861	$243	$559	$1,663
May	Winter	-	1,609	4,173	447	-	14	$688	$223	$558	$1,469
June	Summer	1,058	361	4,599	-	14	-	$420	$866	$204	$1,490
July	Summer	1,117	460	4,994	-	14	-	$220	$916	$206	$1,341
August	Summer	1,395	458	5,135	-	15	-	$60	$976	$207	$1,243
September	Summer	1,734	554	5,889	-	17	-	$1,146	$1,103	$210	$2,458
October	Winter	-	2,444	5,412	789	-	17	$905	$278	$563	$1,746
November	Winter	-	3,161	6,931	1,727	-	22	$1,580	$361	$570	$2,511
December	Winter	-	3,410	7,433	2,060	-	23	$1,823	$368	$572	$2,763
Total		**5,304**	**22,535**	**68,890**	**9,485**	**61**	**154**	**$12,000**	**$6,347**	**$5,353**	**$23,700**

TABLE 40: NEW RECREATION CENTER ELECTRIC BILL (SCE TOU-GS-3-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	4,317	8,955	2,003	-	28	$2,146	$450	$578	$3,174
February	Winter	-	3,747	8,205	1,931	-	28	$1,898	$453	$575	$2,926
March	Winter	-	3,421	8,182	1,107	-	25	$1,613	$405	$572	$2,590
April	Winter	-	2,674	6,608	569	-	22	$1,323	$350	$566	$2,239
May	Winter	-	3,051	7,449	798	-	24	$1,469	$381	$569	$2,420
June	Summer	2,249	836	9,053	-	25	-	$3,211	$518	$220	$3,949
July	Summer	3,170	1,507	11,582	-	34	-	$4,969	$694	$231	$5,893
August	Summer	4,278	1,459	13,631	-	40	-	$6,332	$830	$239	$7,401
September	Summer	5,436	1,873	17,640	-	50	-	$8,784	$1,021	$253	$10,058
October	Winter	-	5,929	11,765	2,581	-	39	$2,988	$622	$589	$4,199
November	Winter	-	4,782	9,925	2,209	-	32	$2,441	$515	$581	$3,538
December	Winter	-	4,675	9,704	2,502	-	30	$2,430	$488	$581	$3,499
Total		**15,133**	**38,273**	**122,700**	**13,700**	**149**	**227**	**$39,604**	**$6,728**	**$5,552**	**$51,884**

TABLE 41: NEW SUSI Q CENTER ELECTRIC BILL (SCE TOU-GS-2-E)

Time Period		Energy Use (kWh)				Max Demand (kW)		Charges			
Month	Season	On-Peak	Mid-Peak	Off-Peak	Super Off-Peak	On-Peak	Mid-Peak	Energy	Demand	Non-Bypassable	Total
January	Winter	-	2,671	5,122	2,985	-	17	$1,650	$270	$217	$2,136
February	Winter	-	2,402	4,696	2,565	-	17	$1,485	$269	$214	$1,968
March	Winter	-	2,412	4,879	2,049	-	16	$1,456	$244	$213	$1,913
April	Winter	-	2,099	4,246	1,576	-	14	$1,244	$220	$209	$1,673
May	Winter	-	2,464	4,908	2,070	-	16	$1,472	$251	$213	$1,936
June	Summer	1,870	681	7,436	-	17	-	$2,047	$1,101	$215	$3,362
July	Summer	3,834	1,817	12,648	-	39	-	$3,925	$2,502	$236	$6,662
August	Summer	4,935	1,610	15,177	-	45	-	$4,772	$2,852	$245	$7,868
September	Summer	5,318	1,719	17,569	-	52	-	$5,304	$3,316	$252	$8,872
October	Winter	-	5,388	8,013	5,336	-	39	$2,915	$611	$237	$3,763
November	Winter	-	2,979	5,902	3,378	-	20	$1,874	$311	$220	$2,405
December	Winter	-	2,766	5,510	3,039	-	18	$1,733	$280	$218	$2,231
Total		**15,958**	**29,006**	**96,106**	**22,999**	**154**	**157**	**$29,876**	**$12,226**	**$2,688**	**$44,791**

FINANCIAL MODELING FOR 24-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 42: CITY HALL BUILDING + EV CHARGING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$1,158,000	**Electric Bill Savings Year 1**	$126,355
BESS Cost	$1,749,000	**25-Year Electric Bill Savings**	$4,486,225
Upfront Payment	$2,907,000	**25-Year IRR**	5%
Total O&M/Inverter Replacement Cost	$336,743	**25-Year ROI**	65%
Total Project Costs	$3,243,743	**25-Year NPV**	$2,114,581
Total Incentives	$872,100	**Payback Period**	Year 15
Net Payments	$2,371,643		

TABLE 43: CITY HALL LIFT STATION KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$201,000	**Electric Bill Savings Year 1**	$25,407
BESS Cost	$461,100	**25-Year Electric Bill Savings**	$882,789
Upfront Payment	$662,100	**25-Year IRR**	4%
Total O&M/Inverter Replacement Cost	$63,851	**25-Year ROI**	49%
Total Project Costs	$725,951	**25-Year NPV**	$355,468
Total Incentives	$198,630	**Payback Period**	Year 16
Net Payments	$527,321		

TABLE 44: CORPORATION YARD KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$555,000	**Electric Bill Savings Year 1**	$81,963
BESS Cost	$1,005,000	**25-Year Electric Bill Savings**	$2,520,443
Upfront Payment	$1,559,400	**25-Year IRR**	6%
Total O&M/Inverter Replacement Cost	$213,369	**25-Year ROI**	69%

Total Project Costs	$1,772,769	**25-Year NPV**	$1,215,494
Total Incentives	$467,820	**Payback Period**	Year 14
Net Payments	$1,304,949		

TABLE 45: RECREATION CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$95,448
BESS Cost	$2,036,700	**25-Year Electric Bill Savings**	$3,103,469
Upfront Payment	$2,774,700	**25-Year IRR**	3%
Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	31%
Total Project Costs	$3,006,004	**25-Year NPV**	$929,875
Total Incentives	$832,410	**Payback Period**	Year 19
Net Payments	$2,173,594		

TABLE 46: RECREATION CENTER LOAD SHEDDING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$87,401
BESS Cost	$1,562,400	**25-Year Electric Bill Savings**	$2,884,536
Upfront Payment	$2,300,400	**25-Year IRR**	4%
Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	41%
Total Project Costs	$2,531,704	**25-Year NPV**	$1,042,952
Total Incentives	$690,120	**Payback Period**	Year 17
Net Payments	$1,841,584		

TABLE 47: SUSI Q CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			

PV Cost	$144,000	**Electric Bill Savings Year 1**	$22,006
BESS Cost	$1,422,900	**25-Year Electric Bill Savings**	$797,091
Upfront Payment	$1,566,900	**25-Year IRR**	-3%
Total O&M/Inverter Replacement Cost	$65,808	**25-Year ROI**	-22%
Total Project Costs	$1,632,708	**25-Year NPV**	-$365,547
Total Incentives	$470,070	**Payback Period**	> Year 25
Net Payments	$1,162,638		

FINANCIAL MODELING FOR 48-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 48: CITY HALL BUILDING + EV CHARGING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$1,158,000	**Electric Bill Savings Year 1**	$126,961
BESS Cost	$2,838,000	**25-Year Electric Bill Savings**	$4,774,654
Upfront Payment	$3,996,000	**25-Year IRR**	3%
Total O&M/Inverter Replacement Cost	$336,743	**25-Year ROI**	38%
Total Project Costs	$4,332,743	**25-Year NPV**	$1,640,711
Total Incentives	$1,198,800	**Payback Period**	Year 19
Net Payments	$3,133,943		

TABLE 49: CITY HALL LIFT STATION KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$201,000	**Electric Bill Savings Year 1**	$26,033
BESS Cost	$779,100	**25-Year Electric Bill Savings**	$985,689
Upfront Payment	$980,100	**25-Year IRR**	2%
Total O&M/Inverter Replacement Cost	$63,851	**25-Year ROI**	23%
Total Project Costs	$1,043,951	**25-Year NPV**	$235,768
Total Incentives	$294,030	**Payback Period**	Year 21

Net Payments	$749,921		

TABLE 50: CORPORATION YARD KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$555,000	**Electric Bill Savings Year 1**	$89,214
BESS Cost	$1,636,800	**25-Year Electric Bill Savings**	$2,878,918
Upfront Payment	$2,191,800	**25-Year IRR**	4%
Total O&M/Inverter Replacement Cost	$213,369	**25-Year ROI**	47%
Total Project Costs	$2,405,169	**25-Year NPV**	$1,131,289
Total Incentives	$657,540	**Payback Period**	Year 16
Net Payments	$1,747,629		

TABLE 51: RECREATION CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$95,616
BESS Cost	$3,403,800	**25-Year Electric Bill Savings**	$3,259,086
Upfront Payment	$4,141,800	**25-Year IRR**	0%
Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	3%
Total Project Costs	$4,373,104	**25-Year NPV**	$128,522
Total Incentives	$1,242,540	**Payback Period**	Year 25
Net Payments	$3,130,564		

TABLE 52: RECREATION CENTER LOAD SHEDDING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$87,535
BESS Cost	$2,594,700	**25-Year Electric Bill Savings**	$3,039,126
Upfront Payment	$3,332,700	**25-Year IRR**	1%

Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	13%
Total Project Costs	$3,564,004	**25-Year NPV**	$474,932
Total Incentives	$999,810	**Payback Period**	Year 22
Net Payments	$2,564,194		

TABLE 53: SUSI Q CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$144,000	**Electric Bill Savings Year 1**	$23,375
BESS Cost	$2,483,100	**25-Year Electric Bill Savings**	$871,441
Upfront Payment	$2,627,100	**25-Year IRR**	-5%
Total O&M/Inverter Replacement Cost	$65,808	**25-Year ROI**	-38%
Total Project Costs	$2,692,908	**25-Year NPV**	-$1,033,336
Total Incentives	$788,130	**Payback Period**	> Year 25
Net Payments	$1,904,778		

FINANCIAL MODELING FOR 72-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 54: CITY HALL BUILDING + EV CHARGING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$1,158,000	**Electric Bill Savings Year 1**	$126,962
BESS Cost	$3,696,000	**25-Year Electric Bill Savings**	$4,895,557
Upfront Payment	$4,854,000	**25-Year IRR**	2%
Total O&M/Inverter Replacement Cost	$336,743	**25-Year ROI**	22%
Total Project Costs	$5,190,743	**25-Year NPV**	$1,161,014
Total Incentives	$1,456,200	**Payback Period**	Year 21
Net Payments	$3,734,543		

TABLE 55: CITY HALL LIFT STATION KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$201,000	**Electric Bill Savings Year 1**	$26,555
BESS Cost	$1,089,150	**25-Year Electric Bill Savings**	$1,034,207
Upfront Payment	$1,290,150	**25-Year IRR**	0%
Total O&M/Inverter Replacement Cost	$63,851	**25-Year ROI**	5%
Total Project Costs	$1,354,001	**25-Year NPV**	$67,251
Total Incentives	$387,045	**Payback Period**	Year 24
Net Payments	$966,956		

TABLE 56: CORPORATION YARD KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$555,000	**Electric Bill Savings Year 1**	$90,095
BESS Cost	$2,157,600	**25-Year Electric Bill Savings**	$3,128,365
Upfront Payment	$2,712,600	**25-Year IRR**	3%
Total O&M/Inverter Replacement Cost	$213,369	**25-Year ROI**	35%
Total Project Costs	$2,925,969	**25-Year NPV**	$1,016,176
Total Incentives	$813,780	**Payback Period**	Year 18
Net Payments	$2,112,189		

TABLE 57: RECREATION CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$95,664
BESS Cost	$4,687,200	**25-Year Electric Bill Savings**	$3,343,157
Upfront Payment	$5,425,200	**25-Year IRR**	-1%
Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	-12%
Total Project Costs	$5,656,504	**25-Year NPV**	-$685,787

Total Incentives	$1,627,560	**Payback Period**	> Year 25
Net Payments	$4,028,944		

TABLE 58: RECREATION CENTER LOAD SHEDDING KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$738,000	**Electric Bill Savings Year 1**	$87,401
BESS Cost	$3,459,600	**25-Year Electric Bill Savings**	$2,884,536
Upfront Payment	$4,197,600	**25-Year IRR**	-1%
Total O&M/Inverter Replacement Cost	$231,304	**25-Year ROI**	-6%
Total Project Costs	$4,428,904	**25-Year NPV**	-$285,088
Total Incentives	$1,259,280	**Payback Period**	> Year 25

TABLE 59: SUSI Q CENTER KEY FINANCIAL INPUTS & METRICS – CASH PURCHASE

Key Financial Outputs			
PV Cost	$144,000	**Electric Bill Savings Year 1**	$23,375
BESS Cost	$3,627,000	**25-Year Electric Bill Savings**	$924,327
Upfront Payment	$3,771,000	**25-Year IRR**	-7%
Total O&M/Inverter Replacement Cost	$65,808	**25-Year ROI**	-46%
Total Project Costs	$3,836,808	**25-Year NPV**	-$1,781,181
Total Incentives	$1,131,300	**Payback Period**	> Year 25
Net Payments	$2,705,508		

FINANCIAL MODELING FOR 24-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 60: MAIN CITY HALL BUILDING WITH FUTURE EV LOAD CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,907,000)		$ -	$ -	$ -	-	$ (2,907,000)	$ (2,907,000)
1	$ -	$ 872,100	$ (6,060)	$ -	$ 126,355	642,674	$ 992,395	$ (1,914,605)
2	$ -		$ (6,242)	$ -	$ 130,950	639,461	$ 124,708	$ (1,789,897)
3	$ -		$ (6,429)	$ -	$ 135,749	636,264	$ 129,320	$ (1,660,577)
4	$ -		$ (6,622)	$ -	$ 135,477	633,082	$ 128,855	$ (1,531,722)
5	$ -		$ (6,821)	$ -	$ 135,791	629,917	$ 128,971	$ (1,402,752)
6	$ -		$ (7,025)	$ -	$ 138,564	626,767	$ 131,539	$ (1,271,213)
7	$ -		$ (7,236)	$ -	$ 143,123	623,634	$ 135,887	$ (1,135,326)
8	$ -		$ (7,453)	$ -	$ 148,014	620,515	$ 140,561	$ (994,765)
9	$ -		$ (7,677)	$ -	$ 153,320	617,413	$ 145,644	$ (849,121)
10	$ -		$ (7,907)	$ -	$ 157,634	614,326	$ 149,727	$ (699,394)
11	$ -		$ (8,144)	$ -	$ 163,017	611,254	$ 154,873	$ (544,521)
12	$ -		$ (8,388)	$ -	$ 168,622	608,198	$ 160,234	$ (384,287)
13	$ -		$ (8,640)	$ -	$ 174,179	605,157	$ 165,539	$ (218,748)
14	$ -		$ (8,899)	$ -	$ 180,751	602,131	$ 171,852	$ (46,896)
15	$ -		$ (9,166)	$ -	$ 187,529	599,120	$ 178,362	$ 131,466
16	$ -		$ (9,441)	$ (115,800)	$ 194,450	596,125	$ 69,208	$ 200,675
17	$ -		$ (9,725)	$ -	$ 200,546	593,144	$ 190,822	$ 391,496
18	$ -		$ (10,016)	$ -	$ 207,952	590,178	$ 197,936	$ 589,432
19	$ -		$ (10,317)	$ -	$ 215,550	587,228	$ 205,233	$ 794,665
20	$ -		$ (10,626)	$ -	$ 222,684	584,291	$ 212,058	$ 1,006,723
21	$ -		$ (10,945)	$ -	$ 230,186	581,370	$ 219,241	$ 1,225,964
22	$ -		$ (11,273)	$ -	$ 231,857	578,463	$ 220,584	$ 1,446,548
23	$ -		$ (11,612)	$ -	$ 234,413	575,571	$ 222,801	$ 1,669,349
24	$ -		$ (11,960)	$ -	$ 233,398	572,693	$ 221,438	$ 1,890,787
25	$ -		$ (12,319)	$ -	$ 236,113	569,830	$ 223,795	$ 2,114,581
Total	**$ (2,907,000)**	**$ 872,100**	**$ (220,943)**	**$ (115,800)**	**$ 4,486,225**	**15,138,807**	**$ 2,114,581**	**$ -**

TABLE 61: CITY HALL LIFT STATION CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (662,100)		$ -	$ -	$ -	-	$ (662,100)	$ (662,100)
1	$ -	$ 198,630	$ (1,200)	$ -	$ 25,407	111,552	$ 222,837	$ (439,263)
2	$ -		$ (1,236)	$ -	$ 26,329	110,995	$ 25,093	$ (414,170)
3	$ -		$ (1,273)	$ -	$ 27,292	110,440	$ 26,018	$ (388,152)
4	$ -		$ (1,311)	$ -	$ 28,298	109,887	$ 26,987	$ (361,165)
5	$ -		$ (1,351)	$ -	$ 29,074	109,338	$ 27,723	$ (333,442)
6	$ -		$ (1,391)	$ -	$ 30,166	108,791	$ 28,775	$ (304,667)
7	$ -		$ (1,433)	$ -	$ 31,306	108,247	$ 29,873	$ (274,794)
8	$ -		$ (1,476)	$ -	$ 32,465	107,706	$ 30,989	$ (243,805)
9	$ -		$ (1,520)	$ -	$ 33,624	107,168	$ 32,103	$ (211,702)
10	$ -		$ (1,566)	$ -	$ 32,913	106,632	$ 31,347	$ (180,355)
11	$ -		$ (1,613)	$ -	$ 34,154	106,099	$ 32,541	$ (147,814)
12	$ -		$ (1,661)	$ -	$ 34,753	105,568	$ 33,092	$ (114,721)
13	$ -		$ (1,711)	$ -	$ 35,342	105,040	$ 33,631	$ (81,091)
14	$ -		$ (1,762)	$ -	$ 36,568	104,515	$ 34,806	$ (46,285)
15	$ -		$ (1,815)	$ -	$ 37,060	103,992	$ 35,245	$ (11,040)
16	$ -		$ (1,870)	$ (20,100)	$ 37,684	103,472	$ 15,714	$ 4,674
17	$ -		$ (1,926)	$ -	$ 38,242	102,955	$ 36,316	$ 40,990
18	$ -		$ (1,983)	$ -	$ 38,413	102,440	$ 36,430	$ 77,420
19	$ -		$ (2,043)	$ -	$ 39,789	101,928	$ 37,747	$ 115,167
20	$ -		$ (2,104)	$ -	$ 40,867	101,418	$ 38,763	$ 153,930
21	$ -		$ (2,167)	$ -	$ 42,255	100,911	$ 40,087	$ 194,017
22	$ -		$ (2,232)	$ -	$ 43,851	100,407	$ 41,619	$ 235,636
23	$ -		$ (2,299)	$ -	$ 45,284	99,905	$ 42,984	$ 278,620
24	$ -		$ (2,368)	$ -	$ 42,518	99,405	$ 40,149	$ 318,770
25	$ -		$ (2,439)	$ -	$ 39,138	98,908	$ 36,699	$ 355,468
Total	**$ (662,100)**	**$ 198,630**	**$ (43,751)**	**$ (20,100)**	**$ 882,789**	**2,627,720**	**$ 355,468**	**$ -**

TABLE 62: CORPORATION YARD WITH FUTURE EV LOAD CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (1,559,400)		$ -	$ -	$ -	-	$ (1,559,400)	$ (1,559,400)
1	$ -	$ 467,820	$ (4,330)	$ -	$ 81,963	297,018	$ 545,453	$ (1,013,947)
2	$ -		$ (4,460)	$ -	$ 84,982	295,533	$ 80,522	$ (933,424)
3	$ -		$ (4,594)	$ -	$ 84,769	294,055	$ 80,175	$ (853,249)
4	$ -		$ (4,732)	$ -	$ 80,010	292,585	$ 75,278	$ (777,971)
5	$ -		$ (4,873)	$ -	$ 82,616	291,122	$ 77,743	$ (700,228)
6	$ -		$ (5,020)	$ -	$ 82,360	289,666	$ 77,341	$ (622,887)
7	$ -		$ (5,170)	$ -	$ 82,417	288,218	$ 77,247	$ (545,640)
8	$ -		$ (5,325)	$ -	$ 85,632	286,777	$ 80,306	$ (465,334)
9	$ -		$ (5,485)	$ -	$ 87,195	285,343	$ 81,709	$ (383,625)
10	$ -		$ (5,650)	$ -	$ 87,605	283,916	$ 81,955	$ (301,669)
11	$ -		$ (5,819)	$ -	$ 91,007	282,497	$ 85,188	$ (216,481)
12	$ -		$ (5,994)	$ -	$ 94,318	281,084	$ 88,324	$ (128,157)
13	$ -		$ (6,174)	$ -	$ 97,494	279,679	$ 91,321	$ (36,836)
14	$ -		$ (6,359)	$ -	$ 100,617	278,280	$ 94,258	$ 57,421
15	$ -		$ (6,550)	$ -	$ 101,229	276,889	$ 94,679	$ 152,101
16	$ -		$ (6,746)	$ (55,500)	$ 103,726	275,505	$ 41,480	$ 193,580
17	$ -		$ (6,948)	$ -	$ 105,314	274,127	$ 98,366	$ 291,946
18	$ -		$ (7,157)	$ -	$ 109,392	272,756	$ 102,235	$ 394,182
19	$ -		$ (7,372)	$ -	$ 113,405	271,393	$ 106,034	$ 500,215
20	$ -		$ (7,593)	$ -	$ 117,258	270,036	$ 109,665	$ 609,881
21	$ -		$ (7,820)	$ -	$ 121,713	268,685	$ 113,892	$ 723,773
22	$ -		$ (8,055)	$ -	$ 125,676	267,342	$ 117,621	$ 841,393
23	$ -		$ (8,297)	$ -	$ 128,976	266,005	$ 120,679	$ 962,073
24	$ -		$ (8,546)	$ -	$ 132,762	264,675	$ 124,216	$ 1,086,288
25	$ -		$ (8,802)	$ -	$ 138,008	263,352	$ 129,206	$ 1,215,494
Total	**$ (1,559,400)**	**$ 467,820**	**$ (157,869)**	**$ (55,500)**	**$ 2,520,443**	**6,996,538**	**$ 1,215,494**	**$ -**

TABLE 63: RECREATION CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,774,700)		$ -	$ -	$ -	-	$ (2,774,700)	$ (2,774,700)
1	$ -	$ 832,410	$ (4,320)	$ -	$ 95,448	414,949	$ 923,538	$ (1,851,162)
2	$ -		$ (4,450)	$ -	$ 95,963	412,874	$ 91,513	$ (1,759,648)
3	$ -		$ (4,583)	$ -	$ 97,382	410,810	$ 92,799	$ (1,666,849)
4	$ -		$ (4,721)	$ -	$ 98,128	408,756	$ 93,407	$ (1,573,442)
5	$ -		$ (4,862)	$ -	$ 100,675	406,712	$ 95,812	$ (1,477,630)
6	$ -		$ (5,008)	$ -	$ 103,508	404,679	$ 98,500	$ (1,379,130)
7	$ -		$ (5,158)	$ -	$ 106,388	402,655	$ 101,229	$ (1,277,900)
8	$ -		$ (5,313)	$ -	$ 109,254	400,642	$ 103,941	$ (1,173,960)
9	$ -		$ (5,472)	$ -	$ 111,783	398,639	$ 106,310	$ (1,067,649)
10	$ -		$ (5,637)	$ -	$ 114,571	396,645	$ 108,934	$ (958,715)
11	$ -		$ (5,806)	$ -	$ 116,870	394,662	$ 111,064	$ (847,651)
12	$ -		$ (5,980)	$ -	$ 119,185	392,689	$ 113,205	$ (734,446)
13	$ -		$ (6,159)	$ -	$ 122,622	390,725	$ 116,463	$ (617,983)
14	$ -		$ (6,344)	$ -	$ 126,169	388,772	$ 119,825	$ (498,157)
15	$ -		$ (6,534)	$ -	$ 129,475	386,828	$ 122,940	$ (375,217)
16	$ -		$ (6,730)	$ (73,800)	$ 131,945	384,894	$ 51,414	$ (323,803)
17	$ -		$ (6,932)	$ -	$ 134,074	382,969	$ 127,142	$ (196,661)
18	$ -		$ (7,140)	$ -	$ 136,619	381,055	$ 129,478	$ (67,183)
19	$ -		$ (7,355)	$ -	$ 140,117	379,149	$ 132,763	$ 65,580
20	$ -		$ (7,575)	$ -	$ 143,802	377,254	$ 136,227	$ 201,807
21	$ -		$ (7,802)	$ -	$ 146,634	375,367	$ 138,832	$ 340,639
22	$ -		$ (8,036)	$ -	$ 150,282	373,490	$ 142,245	$ 482,885
23	$ -		$ (8,278)	$ -	$ 154,262	371,623	$ 145,984	$ 628,869
24	$ -		$ (8,526)	$ -	$ 157,427	369,765	$ 148,901	$ 777,770
25	$ -		$ (8,782)	$ -	$ 160,887	367,916	$ 152,105	$ 929,875
Total	**$ (2,774,700)**	**$ 832,410**	**$ (157,504)**	**$ (73,800)**	**$ 3,103,469**	**9,774,520**	**$ 929,875**	**$ -**

TABLE 64: RECREATION CENTER LOAD SHEDDING CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,300,400)		$ -	$ -	$ -	-	$ (2,300,400)	$ (2,300,400)
1	$ -	$ 690,120	$ (4,320)	$ -	$ 87,401	414,949	$ 773,201	$ (1,527,199)
2	$ -		$ (4,450)	$ -	$ 89,938	412,874	$ 85,489	$ (1,441,711)
3	$ -		$ (4,583)	$ -	$ 91,555	410,810	$ 86,972	$ (1,354,739)
4	$ -		$ (4,721)	$ -	$ 94,122	408,756	$ 89,401	$ (1,265,337)
5	$ -		$ (4,862)	$ -	$ 94,029	406,712	$ 89,167	$ (1,176,170)
6	$ -		$ (5,008)	$ -	$ 96,516	404,679	$ 91,508	$ (1,084,662)
7	$ -		$ (5,158)	$ -	$ 99,276	402,655	$ 94,118	$ (990,544)
8	$ -		$ (5,313)	$ -	$ 101,658	400,642	$ 96,345	$ (894,199)
9	$ -		$ (5,472)	$ -	$ 104,362	398,639	$ 98,890	$ (795,309)
10	$ -		$ (5,637)	$ -	$ 106,530	396,645	$ 100,894	$ (694,415)
11	$ -		$ (5,806)	$ -	$ 108,734	394,662	$ 102,929	$ (591,486)
12	$ -		$ (5,980)	$ -	$ 111,880	392,689	$ 105,900	$ (485,586)
13	$ -		$ (6,159)	$ -	$ 115,112	390,725	$ 108,953	$ (376,633)
14	$ -		$ (6,344)	$ -	$ 118,186	388,772	$ 111,842	$ (264,791)
15	$ -		$ (6,534)	$ -	$ 120,467	386,828	$ 113,933	$ (150,858)
16	$ -		$ (6,730)	$ (73,800)	$ 123,108	384,894	$ 42,577	$ (108,280)
17	$ -		$ (6,932)	$ -	$ 124,955	382,969	$ 118,023	$ 9,742
18	$ -		$ (7,140)	$ -	$ 128,007	381,055	$ 120,867	$ 130,609
19	$ -		$ (7,355)	$ -	$ 130,172	379,149	$ 122,817	$ 253,427
20	$ -		$ (7,575)	$ -	$ 132,074	377,254	$ 124,499	$ 377,926
21	$ -		$ (7,802)	$ -	$ 135,407	375,367	$ 127,604	$ 505,530
22	$ -		$ (8,036)	$ -	$ 137,936	373,490	$ 129,899	$ 635,430
23	$ -		$ (8,278)	$ -	$ 141,623	371,623	$ 133,346	$ 768,775
24	$ -		$ (8,526)	$ -	$ 144,028	369,765	$ 135,502	$ 904,277
25	$ -		$ (8,782)	$ -	$ 147,457	367,916	$ 138,675	$ 1,042,952
Total	**$ (2,300,400)**	**$ 690,120**	**$ (157,504)**	**$ (73,800)**	**$ 2,884,536**	**9,774,520**	**$ 1,042,952**	**$ -**

TABLE 65: SUSI Q CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (1,566,900)		$ -	$ -	$ -	-	$ (1,566,900)	$ (1,566,900)
1	$ -	$ 470,070	$ (1,410)	$ -	$ 22,006	83,384	$ 490,666	$ (1,076,234)
2	$ -		$ (1,452)	$ -	$ 22,895	82,967	$ 21,443	$ (1,054,792)
3	$ -		$ (1,496)	$ -	$ 23,338	82,552	$ 21,842	$ (1,032,950)
4	$ -		$ (1,541)	$ -	$ 23,869	82,140	$ 22,328	$ (1,010,621)
5	$ -		$ (1,587)	$ -	$ 24,584	81,729	$ 22,997	$ (987,624)
6	$ -		$ (1,635)	$ -	$ 25,179	81,320	$ 23,545	$ (964,080)
7	$ -		$ (1,684)	$ -	$ 25,796	80,914	$ 24,113	$ (939,967)
8	$ -		$ (1,734)	$ -	$ 26,832	80,509	$ 25,098	$ (914,869)
9	$ -		$ (1,786)	$ -	$ 27,682	80,107	$ 25,895	$ (888,973)
10	$ -		$ (1,840)	$ -	$ 28,118	79,706	$ 26,278	$ (862,695)
11	$ -		$ (1,895)	$ -	$ 28,709	79,307	$ 26,814	$ (835,882)
12	$ -		$ (1,952)	$ -	$ 29,589	78,911	$ 27,638	$ (808,244)
13	$ -		$ (2,010)	$ -	$ 30,085	78,516	$ 28,075	$ (780,170)
14	$ -		$ (2,071)	$ -	$ 31,155	78,124	$ 29,084	$ (751,086)
15	$ -		$ (2,133)	$ -	$ 32,390	77,733	$ 30,257	$ (720,828)
16	$ -		$ (2,197)	$ (14,400)	$ 33,666	77,344	$ 17,070	$ (703,759)
17	$ -		$ (2,263)	$ -	$ 34,562	76,958	$ 32,299	$ (671,460)
18	$ -		$ (2,331)	$ -	$ 35,552	76,573	$ 33,222	$ (638,238)
19	$ -		$ (2,400)	$ -	$ 36,952	76,190	$ 34,552	$ (603,686)
20	$ -		$ (2,472)	$ -	$ 38,388	75,809	$ 35,916	$ (567,770)
21	$ -		$ (2,547)	$ -	$ 39,921	75,430	$ 37,374	$ (530,396)
22	$ -		$ (2,623)	$ -	$ 41,510	75,053	$ 38,887	$ (491,509)
23	$ -		$ (2,702)	$ -	$ 43,001	74,678	$ 40,299	$ (451,210)
24	$ -		$ (2,783)	$ -	$ 44,745	74,304	$ 41,962	$ (409,248)
25	$ -		$ (2,866)	$ -	$ 46,567	73,933	$ 43,701	$ (365,547)
Total	**$ (1,566,900)**	**$ 470,070**	**$ (51,408)**	**$ (14,400)**	**$ 797,091**	**1,964,191**	**$ (365,547)**	**$ -**

FINANCIAL MODELING FOR 48-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 66: MAIN CITY HALL BUILDING WITH FUTURE EV LOAD CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (3,996,000)		$ -	$ -	$ -	-	$ (3,996,000)	$ (3,996,000)
1	$ -	$ 1,198,800	$ (6,060)	$ -	$ 126,961	642,674	$ 1,319,701	$ (2,676,299)
2	$ -		$ (6,242)	$ -	$ 131,591	639,461	$ 125,349	$ (2,550,950)
3	$ -		$ (6,429)	$ -	$ 136,430	636,264	$ 130,001	$ (2,420,949)
4	$ -		$ (6,622)	$ -	$ 141,489	633,082	$ 134,867	$ (2,286,082)
5	$ -		$ (6,821)	$ -	$ 146,769	629,917	$ 139,949	$ (2,146,133)
6	$ -		$ (7,025)	$ -	$ 152,289	626,767	$ 145,263	$ (2,000,870)
7	$ -		$ (7,236)	$ -	$ 157,357	623,634	$ 150,121	$ (1,850,749)
8	$ -		$ (7,453)	$ -	$ 163,361	620,515	$ 155,908	$ (1,694,841)
9	$ -		$ (7,677)	$ -	$ 169,637	617,413	$ 161,960	$ (1,532,881)
10	$ -		$ (7,907)	$ -	$ 176,191	614,326	$ 168,284	$ (1,364,596)
11	$ -		$ (8,144)	$ -	$ 183,039	611,254	$ 174,895	$ (1,189,701)
12	$ -		$ (8,388)	$ -	$ 179,592	608,198	$ 171,204	$ (1,018,497)
13	$ -		$ (8,640)	$ -	$ 181,542	605,157	$ 172,902	$ (845,595)
14	$ -		$ (8,899)	$ -	$ 186,492	602,131	$ 177,593	$ (668,002)
15	$ -		$ (9,166)	$ -	$ 192,946	599,120	$ 183,780	$ (484,223)
16	$ -		$ (9,441)	$ (115,800)	$ 199,670	596,125	$ 74,429	$ (409,794)
17	$ -		$ (9,725)	$ -	$ 207,089	593,144	$ 197,365	$ (212,429)
18	$ -		$ (10,016)	$ -	$ 212,833	590,178	$ 202,816	$ (9,613)
19	$ -		$ (10,317)	$ -	$ 221,064	587,228	$ 210,747	$ 201,134
20	$ -		$ (10,626)	$ -	$ 228,793	584,291	$ 218,167	$ 419,301
21	$ -		$ (10,945)	$ -	$ 237,002	581,370	$ 226,057	$ 645,358
22	$ -		$ (11,273)	$ -	$ 246,388	578,463	$ 235,114	$ 880,472
23	$ -		$ (11,612)	$ -	$ 255,718	575,571	$ 244,107	$ 1,124,579
24	$ -		$ (11,960)	$ -	$ 265,879	572,693	$ 253,919	$ 1,378,498
25	$ -		$ (12,319)	$ -	$ 274,532	569,830	$ 262,213	$ 1,640,711
Total	**$ (3,996,000)**	**$ 1,198,800**	**$ (220,943)**	**$ (115,800)**	**$ 4,774,654**	**15,138,807**	**$ 1,640,711**	**$ -**

TABLE 67: CITY HALL LIFT STATION CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (980,100)		$ -	$ -	$ -	-	$ (980,100)	$ (980,100)
1	$ -	$ 294,030	$ (1,200)	$ -	$ 26,033	111,552	$ 318,863	$ (661,237)
2	$ -		$ (1,236)	$ -	$ 26,990	110,995	$ 25,754	$ (635,482)
3	$ -		$ (1,273)	$ -	$ 27,986	110,440	$ 26,712	$ (608,770)
4	$ -		$ (1,311)	$ -	$ 28,768	109,887	$ 27,457	$ (581,313)
5	$ -		$ (1,351)	$ -	$ 29,657	109,338	$ 28,306	$ (553,007)
6	$ -		$ (1,391)	$ -	$ 30,676	108,791	$ 29,285	$ (523,722)
7	$ -		$ (1,433)	$ -	$ 31,839	108,247	$ 30,406	$ (493,316)
8	$ -		$ (1,476)	$ -	$ 33,052	107,706	$ 31,576	$ (461,740)
9	$ -		$ (1,520)	$ -	$ 34,318	107,168	$ 32,798	$ (428,942)
10	$ -		$ (1,566)	$ -	$ 35,641	106,632	$ 34,075	$ (394,867)
11	$ -		$ (1,613)	$ -	$ 37,023	106,099	$ 35,410	$ (359,457)
12	$ -		$ (1,661)	$ -	$ 38,469	105,568	$ 36,808	$ (322,649)
13	$ -		$ (1,711)	$ -	$ 39,436	105,040	$ 37,725	$ (284,924)
14	$ -		$ (1,762)	$ -	$ 40,999	104,515	$ 39,236	$ (245,688)
15	$ -		$ (1,815)	$ -	$ 42,628	103,992	$ 40,813	$ (204,875)
16	$ -		$ (1,870)	$ (20,100)	$ 44,331	103,472	$ 22,361	$ (182,514)
17	$ -		$ (1,926)	$ -	$ 45,943	102,955	$ 44,017	$ (138,496)
18	$ -		$ (1,983)	$ -	$ 45,394	102,440	$ 43,411	$ (95,086)
19	$ -		$ (2,043)	$ -	$ 46,620	101,928	$ 44,578	$ (50,508)
20	$ -		$ (2,104)	$ -	$ 48,212	101,418	$ 46,108	$ (4,400)
21	$ -		$ (2,167)	$ -	$ 48,171	100,911	$ 46,004	$ 41,604
22	$ -		$ (2,232)	$ -	$ 49,586	100,407	$ 47,353	$ 88,957
23	$ -		$ (2,299)	$ -	$ 50,703	99,905	$ 48,403	$ 137,360
24	$ -		$ (2,368)	$ -	$ 51,777	99,405	$ 49,409	$ 186,769
25	$ -		$ (2,439)	$ -	$ 51,438	98,908	$ 48,999	$ 235,768
Total	**$ (980,100)**	**$ 294,030**	**$ (43,751)**	**$ (20,100)**	**$ 985,689**	**2,627,720**	**$ 235,768**	**$ -**

TABLE 68: CORPORATION YARD WITH FUTURE EV LOAD CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,191,800)		$ -	$ -	$ -	-	$ (2,191,800)	$ (2,191,800)
1	$ -	$ 657,540	$ (4,330)	$ -	$ 89,214	297,018	$ 742,424	$ (1,449,376)
2	$ -		$ (4,460)	$ -	$ 92,241	295,533	$ 87,781	$ (1,361,595)
3	$ -		$ (4,594)	$ -	$ 96,049	294,055	$ 91,455	$ (1,270,140)
4	$ -		$ (4,732)	$ -	$ 99,631	292,585	$ 94,900	$ (1,175,240)
5	$ -		$ (4,873)	$ -	$ 103,265	291,122	$ 98,392	$ (1,076,849)
6	$ -		$ (5,020)	$ -	$ 103,215	289,666	$ 98,195	$ (978,653)
7	$ -		$ (5,170)	$ -	$ 106,910	288,218	$ 101,740	$ (876,913)
8	$ -		$ (5,325)	$ -	$ 107,855	286,777	$ 102,530	$ (774,384)
9	$ -		$ (5,485)	$ -	$ 112,357	285,343	$ 106,872	$ (667,511)
10	$ -		$ (5,650)	$ -	$ 112,772	283,916	$ 107,122	$ (560,389)
11	$ -		$ (5,819)	$ -	$ 105,456	282,497	$ 99,637	$ (460,753)
12	$ -		$ (5,994)	$ -	$ 109,325	281,084	$ 103,332	$ (357,421)
13	$ -		$ (6,174)	$ -	$ 110,204	279,679	$ 104,031	$ (253,390)
14	$ -		$ (6,359)	$ -	$ 112,588	278,280	$ 106,230	$ (147,161)
15	$ -		$ (6,550)	$ -	$ 113,331	276,889	$ 106,782	$ (40,379)
16	$ -		$ (6,746)	$ (55,500)	$ 115,433	275,505	$ 53,187	$ 12,808
17	$ -		$ (6,948)	$ -	$ 115,837	274,127	$ 108,889	$ 121,697
18	$ -		$ (7,157)	$ -	$ 120,540	272,756	$ 113,384	$ 235,080
19	$ -		$ (7,372)	$ -	$ 125,117	271,393	$ 117,745	$ 352,825
20	$ -		$ (7,593)	$ -	$ 129,497	270,036	$ 121,905	$ 474,730
21	$ -		$ (7,820)	$ -	$ 134,318	268,685	$ 126,497	$ 601,227
22	$ -		$ (8,055)	$ -	$ 137,544	267,342	$ 129,489	$ 730,716
23	$ -		$ (8,297)	$ -	$ 139,630	266,005	$ 131,333	$ 862,049
24	$ -		$ (8,546)	$ -	$ 141,071	264,675	$ 132,525	$ 994,575
25	$ -		$ (8,802)	$ -	$ 145,517	263,352	$ 136,715	$ 1,131,289
Total	**$ (2,191,800)**	**$ 657,540**	**$ (157,869)**	**$ (55,500)**	**$ 2,878,918**	**6,996,538**	**$ 1,131,289**	**$ -**

TABLE 69: RECREATION CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (4,141,800)		$ -	$ -	$ -	-	$ (4,141,800)	$ (4,141,800)
1	$ -	$ 1,242,540	$ (4,320)	$ -	$ 95,616	414,949	$ 1,333,836	$ (2,807,964)
2	$ -		$ (4,450)	$ -	$ 98,489	412,874	$ 94,039	$ (2,713,925)
3	$ -		$ (4,583)	$ -	$ 101,464	410,810	$ 96,881	$ (2,617,044)
4	$ -		$ (4,721)	$ -	$ 104,546	408,756	$ 99,825	$ (2,517,219)
5	$ -		$ (4,862)	$ -	$ 107,737	406,712	$ 102,875	$ (2,414,344)
6	$ -		$ (5,008)	$ -	$ 111,042	404,679	$ 106,034	$ (2,308,310)
7	$ -		$ (5,158)	$ -	$ 114,464	402,655	$ 109,306	$ (2,199,004)
8	$ -		$ (5,313)	$ -	$ 117,774	400,642	$ 112,461	$ (2,086,543)
9	$ -		$ (5,472)	$ -	$ 120,797	398,639	$ 115,324	$ (1,971,219)
10	$ -		$ (5,637)	$ -	$ 121,386	396,645	$ 115,749	$ (1,855,470)
11	$ -		$ (5,806)	$ -	$ 120,760	394,662	$ 114,955	$ (1,740,515)
12	$ -		$ (5,980)	$ -	$ 123,775	392,689	$ 117,795	$ (1,622,721)
13	$ -		$ (6,159)	$ -	$ 127,437	390,725	$ 121,278	$ (1,501,443)
14	$ -		$ (6,344)	$ -	$ 130,954	388,772	$ 124,610	$ (1,376,833)
15	$ -		$ (6,534)	$ -	$ 134,626	386,828	$ 128,091	$ (1,248,741)
16	$ -		$ (6,730)	$ (73,800)	$ 138,603	384,894	$ 58,073	$ (1,190,668)
17	$ -		$ (6,932)	$ -	$ 141,679	382,969	$ 134,747	$ (1,055,922)
18	$ -		$ (7,140)	$ -	$ 143,635	381,055	$ 136,494	$ (919,427)
19	$ -		$ (7,355)	$ -	$ 146,347	379,149	$ 138,993	$ (780,434)
20	$ -		$ (7,575)	$ -	$ 149,073	377,254	$ 141,497	$ (638,937)
21	$ -		$ (7,802)	$ -	$ 153,316	375,367	$ 145,514	$ (493,423)
22	$ -		$ (8,036)	$ -	$ 157,811	373,490	$ 149,775	$ (343,648)
23	$ -		$ (8,278)	$ -	$ 162,433	371,623	$ 154,156	$ (189,492)
24	$ -		$ (8,526)	$ -	$ 165,438	369,765	$ 156,912	$ (32,580)
25	$ -		$ (8,782)	$ -	$ 169,883	367,916	$ 161,102	$ 128,522
Total	**$ (4,141,800)**	**$ 1,242,540**	**$ (157,504)**	**$ (73,800)**	**$ 3,259,086**	**9,774,520**	**$ 128,522**	**$ -**

TABLE 70: RECREATION CENTER LOAD SHEDDING CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (3,332,700)		$ -	$ -	$ -	-	$ (3,332,700)	$ (3,332,700)
1	$ -	$ 999,810	$ (4,320)	$ -	$ 87,535	414,949	$ 1,083,025	$ (2,249,675)
2	$ -		$ (4,450)	$ -	$ 90,121	412,874	$ 85,671	$ (2,164,004)
3	$ -		$ (4,583)	$ -	$ 92,788	410,810	$ 88,205	$ (2,075,799)
4	$ -		$ (4,721)	$ -	$ 95,550	408,756	$ 90,829	$ (1,984,970)
5	$ -		$ (4,862)	$ -	$ 98,411	406,712	$ 93,549	$ (1,891,421)
6	$ -		$ (5,008)	$ -	$ 101,372	404,679	$ 96,364	$ (1,795,057)
7	$ -		$ (5,158)	$ -	$ 104,429	402,655	$ 99,271	$ (1,695,786)
8	$ -		$ (5,313)	$ -	$ 107,584	400,642	$ 102,271	$ (1,593,515)
9	$ -		$ (5,472)	$ -	$ 110,839	398,639	$ 105,367	$ (1,488,149)
10	$ -		$ (5,637)	$ -	$ 113,442	396,645	$ 107,805	$ (1,380,343)
11	$ -		$ (5,806)	$ -	$ 116,097	394,662	$ 110,291	$ (1,270,052)
12	$ -		$ (5,980)	$ -	$ 117,426	392,689	$ 111,446	$ (1,158,606)
13	$ -		$ (6,159)	$ -	$ 118,996	390,725	$ 112,836	$ (1,045,769)
14	$ -		$ (6,344)	$ -	$ 122,523	388,772	$ 116,179	$ (929,590)
15	$ -		$ (6,534)	$ -	$ 125,941	386,828	$ 119,407	$ (810,184)
16	$ -		$ (6,730)	$ (73,800)	$ 128,905	384,894	$ 48,375	$ (761,809)
17	$ -		$ (6,932)	$ -	$ 132,254	382,969	$ 125,322	$ (636,487)
18	$ -		$ (7,140)	$ -	$ 135,248	381,055	$ 128,108	$ (508,379)
19	$ -		$ (7,355)	$ -	$ 137,891	379,149	$ 130,537	$ (377,843)
20	$ -		$ (7,575)	$ -	$ 141,706	377,254	$ 134,131	$ (243,712)
21	$ -		$ (7,802)	$ -	$ 145,944	375,367	$ 138,142	$ (105,570)
22	$ -		$ (8,036)	$ -	$ 149,932	373,490	$ 141,896	$ 36,325
23	$ -		$ (8,278)	$ -	$ 152,414	371,623	$ 144,136	$ 180,461
24	$ -		$ (8,526)	$ -	$ 154,513	369,765	$ 145,988	$ 326,449
25	$ -		$ (8,782)	$ -	$ 157,264	367,916	$ 148,483	$ 474,932
Total	**$ (3,332,700)**	**$ 999,810**	**$ (157,504)**	**$ (73,800)**	**$ 3,039,126**	**9,774,520**	**$ 474,932**	**$ -**

TABLE 71: SUSI Q CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,627,100)		$ -	$ -	$ -	-	$ (2,627,100)	$ (2,627,100)
1	$ -	$ 788,130	$ (1,410)	$ -	$ 23,375	83,384	$ 810,095	$ (1,817,005)
2	$ -		$ (1,452)	$ -	$ 24,336	82,967	$ 22,883	$ (1,794,122)
3	$ -		$ (1,496)	$ -	$ 25,339	82,552	$ 23,843	$ (1,770,278)
4	$ -		$ (1,541)	$ -	$ 26,388	82,140	$ 24,847	$ (1,745,431)
5	$ -		$ (1,587)	$ -	$ 27,484	81,729	$ 25,897	$ (1,719,535)
6	$ -		$ (1,635)	$ -	$ 28,629	81,320	$ 26,994	$ (1,692,541)
7	$ -		$ (1,684)	$ -	$ 29,825	80,914	$ 28,141	$ (1,664,399)
8	$ -		$ (1,734)	$ -	$ 29,190	80,509	$ 27,456	$ (1,636,944)
9	$ -		$ (1,786)	$ -	$ 30,395	80,107	$ 28,608	$ (1,608,335)
10	$ -		$ (1,840)	$ -	$ 31,658	79,706	$ 29,818	$ (1,578,517)
11	$ -		$ (1,895)	$ -	$ 32,535	79,307	$ 30,640	$ (1,547,877)
12	$ -		$ (1,952)	$ -	$ 33,547	78,911	$ 31,595	$ (1,516,282)
13	$ -		$ (2,010)	$ -	$ 34,278	78,516	$ 32,268	$ (1,484,014)
14	$ -		$ (2,071)	$ -	$ 35,262	78,124	$ 33,191	$ (1,450,823)
15	$ -		$ (2,133)	$ -	$ 36,141	77,733	$ 34,008	$ (1,416,815)
16	$ -		$ (2,197)	$ (14,400)	$ 37,134	77,344	$ 20,538	$ (1,396,277)
17	$ -		$ (2,263)	$ -	$ 38,668	76,958	$ 36,405	$ (1,359,872)
18	$ -		$ (2,331)	$ -	$ 39,017	76,573	$ 36,687	$ (1,323,185)
19	$ -		$ (2,400)	$ -	$ 40,286	76,190	$ 37,886	$ (1,285,299)
20	$ -		$ (2,472)	$ -	$ 41,326	75,809	$ 38,854	$ (1,246,445)
21	$ -		$ (2,547)	$ -	$ 42,189	75,430	$ 39,642	$ (1,206,803)
22	$ -		$ (2,623)	$ -	$ 43,442	75,053	$ 40,819	$ (1,165,984)
23	$ -		$ (2,702)	$ -	$ 45,161	74,678	$ 42,459	$ (1,123,526)
24	$ -		$ (2,783)	$ -	$ 46,954	74,304	$ 44,171	$ (1,079,354)
25	$ -		$ (2,866)	$ -	$ 48,884	73,933	$ 46,018	$ (1,033,336)
Total	**$ (2,627,100)**	**$ 788,130**	**$ (51,408)**	**$ (14,400)**	**$ 871,441**	**1,964,191**	**$ (1,033,336)**	**$ -**

FINANCIAL MODELING FOR 72-HOUR WITH A 90% LIKELIHOOD OF RIDE-THROUGH

TABLE 72: MAIN CITY HALL BUILDING CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (4,854,000)		$ -	$ -	$ -	-	$ (4,854,000)	$ (4,854,000)
1	$ -	$ 1,456,200	$ (6,060)	$ -	$ 126,962	642,674	$ 1,577,102	$ (3,276,898)
2	$ -		$ (6,242)	$ -	$ 131,600	639,461	$ 125,359	$ (3,151,539)
3	$ -		$ (6,429)	$ -	$ 136,449	636,264	$ 130,020	$ (3,021,519)
4	$ -		$ (6,622)	$ -	$ 141,517	633,082	$ 134,895	$ (2,886,624)
5	$ -		$ (6,821)	$ -	$ 146,816	629,917	$ 139,996	$ (2,746,629)
6	$ -		$ (7,025)	$ -	$ 152,345	626,767	$ 145,320	$ (2,601,309)
7	$ -		$ (7,236)	$ -	$ 158,126	623,634	$ 150,890	$ (2,450,418)
8	$ -		$ (7,453)	$ -	$ 164,171	620,515	$ 156,718	$ (2,293,700)
9	$ -		$ (7,677)	$ -	$ 170,482	617,413	$ 162,805	$ (2,130,895)
10	$ -		$ (7,907)	$ -	$ 177,077	614,326	$ 169,170	$ (1,961,725)
11	$ -		$ (8,144)	$ -	$ 183,125	611,254	$ 174,981	$ (1,786,744)
12	$ -		$ (8,388)	$ -	$ 190,299	608,198	$ 181,910	$ (1,604,834)
13	$ -		$ (8,640)	$ -	$ 197,739	605,157	$ 189,098	$ (1,415,735)
14	$ -		$ (8,899)	$ -	$ 205,376	602,131	$ 196,476	$ (1,219,259)
15	$ -		$ (9,166)	$ -	$ 213,347	599,120	$ 204,180	$ (1,015,078)
16	$ -		$ (9,441)	$ (115,800)	$ 212,412	596,125	$ 87,170	$ (927,908)
17	$ -		$ (9,725)	$ -	$ 213,146	593,144	$ 203,421	$ (724,487)
18	$ -		$ (10,016)	$ -	$ 217,672	590,178	$ 207,656	$ (516,830)
19	$ -		$ (10,317)	$ -	$ 225,347	587,228	$ 215,030	$ (301,801)
20	$ -		$ (10,626)	$ -	$ 234,005	584,291	$ 223,379	$ (78,421)
21	$ -		$ (10,945)	$ -	$ 242,641	581,370	$ 231,696	$ 153,275
22	$ -		$ (11,273)	$ -	$ 249,902	578,463	$ 238,628	$ 391,903
23	$ -		$ (11,612)	$ -	$ 259,020	575,571	$ 247,409	$ 639,312
24	$ -		$ (11,960)	$ -	$ 268,087	572,693	$ 256,127	$ 895,439
25	$ -		$ (12,319)	$ -	$ 277,894	569,830	$ 265,575	$ 1,161,014
Total	**$ (4,854,000)**	**$ 1,456,200**	**$ (220,943)**	**$ (115,800)**	**$ 4,895,557**	**15,138,807**	**$ 1,161,014**	**$ -**

TABLE 73: CITY HALL LIFT STATION CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (1,290,150)		$ -	$ -	$ -	-	$ (1,290,150)	$ (1,290,150)
1	$ -	$ 387,045	$ (1,200)	$ -	$ 26,555	111,552	$ 412,400	$ (877,750)
2	$ -		$ (1,236)	$ -	$ 27,466	110,995	$ 26,230	$ (851,520)
3	$ -		$ (1,273)	$ -	$ 28,158	110,440	$ 26,885	$ (824,635)
4	$ -		$ (1,311)	$ -	$ 29,131	109,887	$ 27,820	$ (796,816)
5	$ -		$ (1,351)	$ -	$ 30,233	109,338	$ 28,883	$ (767,933)
6	$ -		$ (1,391)	$ -	$ 31,385	108,791	$ 29,994	$ (737,939)
7	$ -		$ (1,433)	$ -	$ 32,584	108,247	$ 31,151	$ (706,788)
8	$ -		$ (1,476)	$ -	$ 33,836	107,706	$ 32,360	$ (674,428)
9	$ -		$ (1,520)	$ -	$ 34,816	107,168	$ 33,296	$ (641,132)
10	$ -		$ (1,566)	$ -	$ 36,156	106,632	$ 34,590	$ (606,542)
11	$ -		$ (1,613)	$ -	$ 37,196	106,099	$ 35,583	$ (570,959)
12	$ -		$ (1,661)	$ -	$ 38,653	105,568	$ 36,992	$ (533,967)
13	$ -		$ (1,711)	$ -	$ 40,174	105,040	$ 38,463	$ (495,504)
14	$ -		$ (1,762)	$ -	$ 41,763	104,515	$ 40,001	$ (455,503)
15	$ -		$ (1,815)	$ -	$ 43,422	103,992	$ 41,607	$ (413,896)
16	$ -		$ (1,870)	$ (20,100)	$ 45,156	103,472	$ 23,187	$ (390,709)
17	$ -		$ (1,926)	$ -	$ 46,737	102,955	$ 44,812	$ (345,897)
18	$ -		$ (1,983)	$ -	$ 48,173	102,440	$ 46,190	$ (299,707)
19	$ -		$ (2,043)	$ -	$ 50,133	101,928	$ 48,090	$ (251,618)
20	$ -		$ (2,104)	$ -	$ 52,181	101,418	$ 50,077	$ (201,541)
21	$ -		$ (2,167)	$ -	$ 54,319	100,911	$ 52,152	$ (149,389)
22	$ -		$ (2,232)	$ -	$ 55,709	100,407	$ 53,476	$ (95,913)
23	$ -		$ (2,299)	$ -	$ 56,751	99,905	$ 54,452	$ (41,461)
24	$ -		$ (2,368)	$ -	$ 55,738	99,405	$ 53,370	$ 11,909
25	$ -		$ (2,439)	$ -	$ 57,781	98,908	$ 55,342	$ 67,251
Total	**$ (1,290,150)**	**$ 387,045**	**$ (43,751)**	**$ (20,100)**	**$ 1,034,207**	**2,627,720**	**$ 67,251**	**$ -**

TABLE 74: CORPORATION YARD WITH FUTURE EV LOAD CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (2,712,600)		$ -	$ -	$ -	-	$ (2,712,600)	$ (2,712,600)
1	$ -	$ 813,780	$ (4,330)	$ -	$ 90,095	297,018	$ 899,545	$ (1,813,055)
2	$ -		$ (4,460)	$ -	$ 93,821	295,533	$ 89,362	$ (1,723,694)
3	$ -		$ (4,594)	$ -	$ 97,720	294,055	$ 93,126	$ (1,630,567)
4	$ -		$ (4,732)	$ -	$ 101,802	292,585	$ 97,071	$ (1,533,496)
5	$ -		$ (4,873)	$ -	$ 105,042	291,122	$ 100,168	$ (1,433,328)
6	$ -		$ (5,020)	$ -	$ 108,752	289,666	$ 103,732	$ (1,329,596)
7	$ -		$ (5,170)	$ -	$ 113,273	288,218	$ 108,102	$ (1,221,494)
8	$ -		$ (5,325)	$ -	$ 117,584	286,777	$ 112,259	$ (1,109,235)
9	$ -		$ (5,485)	$ -	$ 122,361	285,343	$ 116,876	$ (992,359)
10	$ -		$ (5,650)	$ -	$ 124,563	283,916	$ 118,914	$ (873,445)
11	$ -		$ (5,819)	$ -	$ 126,469	282,497	$ 120,650	$ (752,795)
12	$ -		$ (5,994)	$ -	$ 127,755	281,084	$ 121,762	$ (631,033)
13	$ -		$ (6,174)	$ -	$ 132,828	279,679	$ 126,655	$ (504,378)
14	$ -		$ (6,359)	$ -	$ 137,348	278,280	$ 130,989	$ (373,390)
15	$ -		$ (6,550)	$ -	$ 124,381	276,889	$ 117,831	$ (255,558)
16	$ -		$ (6,746)	$ (55,500)	$ 129,114	275,505	$ 66,868	$ (188,690)
17	$ -		$ (6,948)	$ -	$ 132,105	274,127	$ 125,157	$ (63,533)
18	$ -		$ (7,157)	$ -	$ 133,393	272,756	$ 126,236	$ 62,703
19	$ -		$ (7,372)	$ -	$ 133,628	271,393	$ 126,256	$ 188,960
20	$ -		$ (7,593)	$ -	$ 136,680	270,036	$ 129,087	$ 318,047
21	$ -		$ (7,820)	$ -	$ 137,813	268,685	$ 129,993	$ 448,040
22	$ -		$ (8,055)	$ -	$ 142,134	267,342	$ 134,079	$ 582,119
23	$ -		$ (8,297)	$ -	$ 147,837	266,005	$ 139,540	$ 721,659
24	$ -		$ (8,546)	$ -	$ 152,921	264,675	$ 144,375	$ 866,034
25	$ -		$ (8,802)	$ -	$ 158,944	263,352	$ 150,142	$ 1,016,176
Total	**$ (2,712,600)**	**$ 813,780**	**$ (157,869)**	**$ (55,500)**	**$ 3,128,365**	**6,996,538**	**$ 1,016,176**	**$ -**

TABLE 75: RECREATION CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (5,425,200)		$ -	$ -	$ -	-	$ (5,425,200)	$ (5,425,200)
1	$ -	$ 1,627,560	$ (4,320)	$ -	$ 95,664	414,949	$ 1,718,904	$ (3,706,296)
2	$ -		$ (4,450)	$ -	$ 98,563	412,874	$ 94,114	$ (3,612,182)
3	$ -		$ (4,583)	$ -	$ 101,566	410,810	$ 96,983	$ (3,515,199)
4	$ -		$ (4,721)	$ -	$ 104,657	408,756	$ 99,937	$ (3,415,262)
5	$ -		$ (4,862)	$ -	$ 107,845	406,712	$ 102,983	$ (3,312,279)
6	$ -		$ (5,008)	$ -	$ 111,148	404,679	$ 106,140	$ (3,206,139)
7	$ -		$ (5,158)	$ -	$ 114,569	402,655	$ 109,411	$ (3,096,728)
8	$ -		$ (5,313)	$ -	$ 118,113	400,642	$ 112,800	$ (2,983,928)
9	$ -		$ (5,472)	$ -	$ 120,957	398,639	$ 115,485	$ (2,868,443)
10	$ -		$ (5,637)	$ -	$ 124,089	396,645	$ 118,453	$ (2,749,991)
11	$ -		$ (5,806)	$ -	$ 127,298	394,662	$ 121,492	$ (2,628,499)
12	$ -		$ (5,980)	$ -	$ 130,863	392,689	$ 124,883	$ (2,503,616)
13	$ -		$ (6,159)	$ -	$ 134,916	390,725	$ 128,757	$ (2,374,859)
14	$ -		$ (6,344)	$ -	$ 139,109	388,772	$ 132,765	$ (2,242,094)
15	$ -		$ (6,534)	$ -	$ 140,340	386,828	$ 133,805	$ (2,108,289)
16	$ -		$ (6,730)	$ (73,800)	$ 139,419	384,894	$ 58,888	$ (2,049,401)
17	$ -		$ (6,932)	$ -	$ 143,218	382,969	$ 136,286	$ (1,913,114)
18	$ -		$ (7,140)	$ -	$ 147,537	381,055	$ 140,396	$ (1,772,718)
19	$ -		$ (7,355)	$ -	$ 152,011	379,149	$ 144,656	$ (1,628,062)
20	$ -		$ (7,575)	$ -	$ 156,609	377,254	$ 149,034	$ (1,479,028)
21	$ -		$ (7,802)	$ -	$ 161,318	375,367	$ 153,515	$ (1,325,513)
22	$ -		$ (8,036)	$ -	$ 162,942	373,490	$ 154,905	$ (1,170,608)
23	$ -		$ (8,278)	$ -	$ 166,859	371,623	$ 158,582	$ (1,012,026)
24	$ -		$ (8,526)	$ -	$ 170,435	369,765	$ 161,909	$ (850,117)
25	$ -		$ (8,782)	$ -	$ 173,112	367,916	$ 164,330	$ (685,787)
Total	**$ (5,425,200)**	**$ 1,627,560**	**$ (157,504)**	**$ (73,800)**	**$ 3,343,157**	**9,774,520**	**$ (685,787)**	**$ -**

TABLE 76: RECREATION CENTER LOAD SHEDDING CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (4,197,600)		$ -	$ -	$ -	-	$ (4,197,600)	$ (4,197,600)
1	$ -	$ 1,259,280	$ (4,320)	$ -	$ 87,401	414,949	$ 1,342,361	$ (2,855,239)
2	$ -		$ (4,450)	$ -	$ 89,938	412,874	$ 85,489	$ (2,769,751)
3	$ -		$ (4,583)	$ -	$ 91,555	410,810	$ 86,972	$ (2,682,779)
4	$ -		$ (4,721)	$ -	$ 94,122	408,756	$ 89,401	$ (2,593,377)
5	$ -		$ (4,862)	$ -	$ 94,029	406,712	$ 89,167	$ (2,504,210)
6	$ -		$ (5,008)	$ -	$ 96,516	404,679	$ 91,508	$ (2,412,702)
7	$ -		$ (5,158)	$ -	$ 99,276	402,655	$ 94,118	$ (2,318,584)
8	$ -		$ (5,313)	$ -	$ 101,658	400,642	$ 96,345	$ (2,222,239)
9	$ -		$ (5,472)	$ -	$ 104,362	398,639	$ 98,890	$ (2,123,349)
10	$ -		$ (5,637)	$ -	$ 106,530	396,645	$ 100,894	$ (2,022,455)
11	$ -		$ (5,806)	$ -	$ 108,734	394,662	$ 102,929	$ (1,919,526)
12	$ -		$ (5,980)	$ -	$ 111,880	392,689	$ 105,900	$ (1,813,626)
13	$ -		$ (6,159)	$ -	$ 115,112	390,725	$ 108,953	$ (1,704,673)
14	$ -		$ (6,344)	$ -	$ 118,186	388,772	$ 111,842	$ (1,592,831)
15	$ -		$ (6,534)	$ -	$ 120,467	386,828	$ 113,933	$ (1,478,898)
16	$ -		$ (6,730)	$ (73,800)	$ 123,108	384,894	$ 42,577	$ (1,436,320)
17	$ -		$ (6,932)	$ -	$ 124,955	382,969	$ 118,023	$ (1,318,298)
18	$ -		$ (7,140)	$ -	$ 128,007	381,055	$ 120,867	$ (1,197,431)
19	$ -		$ (7,355)	$ -	$ 130,172	379,149	$ 122,817	$ (1,074,613)
20	$ -		$ (7,575)	$ -	$ 132,074	377,254	$ 124,499	$ (950,114)
21	$ -		$ (7,802)	$ -	$ 135,407	375,367	$ 127,604	$ (822,510)
22	$ -		$ (8,036)	$ -	$ 137,936	373,490	$ 129,899	$ (692,610)
23	$ -		$ (8,278)	$ -	$ 141,623	371,623	$ 133,346	$ (559,265)
24	$ -		$ (8,526)	$ -	$ 144,028	369,765	$ 135,502	$ (423,763)
25	$ -		$ (8,782)	$ -	$ 147,457	367,916	$ 138,675	$ (285,088)
Total	**$ (4,197,600)**	**$ 1,259,280**	**$ (157,504)**	**$ (73,800)**	**$ 2,884,536**	**9,774,520**	**$ (285,088)**	**$ -**

TABLE 77: SUSI Q CENTER CASH PURCHASE PRO FORMA

Years	Project Costs	ITC Funding	O&M	Inverter Replacement	Electric Bill Savings	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	$ (3,771,000)		$ -	$ -	$ -	-	$ (3,771,000)	$ (3,771,000)
1	$ -	$ 1,131,300	$ (1,410)	$ -	$ 23,375	83,384	$ 1,153,265	$ (2,617,735)
2	$ -		$ (1,452)	$ -	$ 24,336	82,967	$ 22,883	$ (2,594,852)
3	$ -		$ (1,496)	$ -	$ 25,339	82,552	$ 23,843	$ (2,571,008)
4	$ -		$ (1,541)	$ -	$ 26,388	82,140	$ 24,847	$ (2,546,161)
5	$ -		$ (1,587)	$ -	$ 27,484	81,729	$ 25,897	$ (2,520,265)
6	$ -		$ (1,635)	$ -	$ 28,629	81,320	$ 26,994	$ (2,493,271)
7	$ -		$ (1,684)	$ -	$ 29,825	80,914	$ 28,141	$ (2,465,129)
8	$ -		$ (1,734)	$ -	$ 31,075	80,509	$ 29,341	$ (2,435,788)
9	$ -		$ (1,786)	$ -	$ 32,382	80,107	$ 30,596	$ (2,405,192)
10	$ -		$ (1,840)	$ -	$ 33,749	79,706	$ 31,909	$ (2,373,283)
11	$ -		$ (1,895)	$ -	$ 35,177	79,307	$ 33,282	$ (2,340,001)
12	$ -		$ (1,952)	$ -	$ 36,670	78,911	$ 34,718	$ (2,305,283)
13	$ -		$ (2,010)	$ -	$ 36,066	78,516	$ 34,056	$ (2,271,227)
14	$ -		$ (2,071)	$ -	$ 37,362	78,124	$ 35,291	$ (2,235,936)
15	$ -		$ (2,133)	$ -	$ 38,939	77,733	$ 36,807	$ (2,199,129)
16	$ -		$ (2,197)	$ (14,400)	$ 40,590	77,344	$ 23,993	$ (2,175,136)
17	$ -		$ (2,263)	$ -	$ 41,710	76,958	$ 39,447	$ (2,135,689)
18	$ -		$ (2,331)	$ -	$ 42,739	76,573	$ 40,408	$ (2,095,281)
19	$ -		$ (2,400)	$ -	$ 43,981	76,190	$ 41,580	$ (2,053,700)
20	$ -		$ (2,472)	$ -	$ 45,186	75,809	$ 42,714	$ (2,010,986)
21	$ -		$ (2,547)	$ -	$ 46,465	75,430	$ 43,919	$ (1,967,068)
22	$ -		$ (2,623)	$ -	$ 47,317	75,053	$ 44,694	$ (1,922,373)
23	$ -		$ (2,702)	$ -	$ 48,532	74,678	$ 45,830	$ (1,876,543)
24	$ -		$ (2,783)	$ -	$ 49,900	74,304	$ 47,117	$ (1,829,426)
25	$ -		$ (2,866)	$ -	$ 51,112	73,933	$ 48,245	$ (1,781,181)
Total	**$ (3,771,000)**	**$ 1,131,300**	**$ (51,408)**	**$ (14,400)**	**$ 924,327**	**1,964,191**	**$ (1,781,181)**	**$ -**