ATTACHMENT C

SYSERCO
ENERGY SOLUTIONS

Programming, Cost, and Funding Report

Prepared for the City of Cupertino

EST. 1955

CUPERTINO

Presented by:

Syserco Energy Solutions, Inc.

Date Submitted:

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Executive Summary

The City of Cupertino has been working to evaluate the benefits of adding solar photovoltaic energy systems to a number of locations. The goal of this potential project is to assist in offsetting ongoing electrical utility costs at these locations to provide long term value to the city and its residents.

To develop the recommended project, our experienced energy engineers, project managers, and project developers performed a detailed energy and operational audit of the City's facilities to determine the full potential for savings. This proposal is a culmination of our audit findings, recommended systems, infrastructure enhancements, and overall cost reductions.

We would like to thank the members of the City's staff and facilities team who worked closely with the Syserco Energy Solutions team throughout this process. Without their assistance, this report would not have been possible.

The project development process involved numerous site visits, interaction with City administration and facilities staff, and a detailed analysis of existing equipment and systems and current utility consumption. Studies of energy usage, operating conditions, and interviews with the City's facility team have been valuable sources of information, contributing greatly to this effort. We have taken into consideration the input provided by staff when compiling the proposed project.

The recommended project will design, furnish, and install new solar PV roof mount and carport / shade structure systems at various City sites. These new systems will offset significant electrical energy usage relative to the grid-purchased electrical energy. The recommended system sizes are summarized in the table below:

Recommended Project Summary

Site Name	Nominal Array Size (kW DC)	Nominal System Size (kW AC)	Mounting Type
Blackberry Farm	73.08	60	Carport
Community Hall	49.30	50	Rooftop
Library	422.82	403	Carport / Rooftop
Quinlan Community Center / Senior Center	311.46	273	Carport / Rooftop
Sports Center	214.02	172	Carport
Total	1,070.68	958	

Section 1 – Project Financials

1.1 System Sizing

The systems in the project were sized based on multiple factors to align with the city's goals for the project. The first factor considered was available space – in concert with city staff, ideal areas on each site were identified that would not impact the usage of each site or require the removal of undue quantities of trees. With the usable locations identified on each site, energy consumption was evaluated to determine the maximum amount of energy generation that would be economically beneficial for the site. The systems were then sized within these two constraints to offset as much energy usage as possible at each location within the physical areas identified for use. Options for each site were presented to city staff for evaluation and comment, with preferred layouts selected by the city for each location.

1.2 Annual Energy Savings

Annual Energy Savings for the project were modeled utilizing the industry-standard software application Energy Toolbase based on data from site-specific models that were developed in Helioscope, another industry-standard software application. This model projects the energy savings provided by the array based on the estimated energy production within each time interval, to ensure that the impacts of time-of-use (TOU) rate schedules and non-bypassable charges are accurately accounted for. The first-year energy savings depicted in the table below assume a roughly 18-month duration between the issuance of this report and system completion and incorporate an estimated annual utility escalation rate of 5% during this time period. While first-year savings are presented in the table below, it is important to note that annual energy savings are estimated to change over time. Utility rates are anticipated to continue to rise over time, and throughout the project's life cycle the modules are expected to degrade annually. For the purposes of the estimated payback period listed below, the annual utility escalation is estimated to be 5%, and the annual PV module degradation rate is assumed to be 0.5%. Additionally, the city has submitted interconnection applications under the NEM2 tariff, which is far more lucrative than the current NEM3 tariff – this allows the systems to be locked into this NEM2 tariff for 20 years from project permission to operate, after which time they will be transitioned to the NEM3 rate tariff. Syserco Energy Solutions assisted the city in accomplishing this by applying for utility interconnection of these systems prior to the April 15th, 2023 NEM2 application deadline. It is important to note that to capture this 20-year NEM2 eligibility, these projects must be completed by April 15th, 2026.

1.3 Budget Impact / Financing Options

Site Name	Nominal Array Size (kW DC)	System Price[1]	Estimated Direct Pay ITC[1]	Net Price[1]	First Year Energy Savings[1,2]	Estimated Payback Period (Years)
Blackberry Farm	73.08	$1,056,000	$382,400	$673,600	$38,253	14.08
Community Hall	49.30	$377,000	$150,800	$226,200	$29,441	7.15
Library	422.82	$4,103,000	$1,521,200	$2,581,800	$189,074	11.33
Quinlan Community Center / Senior Center	311.46	$2,493,000	$867,200	$1,625,800	$154,217	9.21
Sports Center	214.02	$1,965,000	$726,000	$1,239,000	$93,047	11.11
Total	1,070.68	$9,994,000	$3,647,600	$6,346,400	$504,032	10.66

[1]Note: All costs and savings figures presented are estimates.

[2]Projected first year energy savings shown in table are indicative of the avoided electric utility costs the site will experience, which will manifest in the form of lowered utility bills on each site.

Financing Options

Solar PV systems can be financed in multiple ways to alleviate construction cash flow challenges. The main financial vehicles available for the project are a cash purchase, tax-exempt lease purchase (TELP), or a power purchase agreement (PPA). A cash purchase model is the simplest funding strategy for the project. This methodology would utilize direct funding from the city to procure the project, which would have several benefits for the city. The city would be able to monetize the direct pay credit from the federal government (available via the Inflation Reduction Act), essentially providing a significant rebate for the project. When meeting prevailing wage and apprenticeship requirements, this direct pay credit amounts to 30% of the total PV project cost. For public entities receiving direct pay credits, there is a penalty for not meeting domestic content thresholds on the project, which can reduce this 30% credit by 15% for projects beginning in 2025 (i.e. reducing the 30% credit to 25.5%.) In addition to avoiding this credit reduction, utilizing domestic content on the project provides a 10-percentage point increase on the baseline direct pay credit, which would increase the realized benefit to the city from 25.5% of PV project costs to 40% of PV project costs when meeting domestic content requirements.

To meet the domestic content requirements, all iron and steel used in the project must have all manufacturing processes taking place in the United States, and (for projects beginning in 2025,) 45% of the total costs of all manufactured products (including components) in the facility must be mined, produced, or manufactured in the United States.

As a result of this, the project has been conceptually designed to utilize equipment which meets the domestic content requirement. Additionally, the city would directly receive all of the benefits provided by the system, including Renewable Energy Credits (RECs), which are the “green attributes” of the energy generated by the array which can be separately sold. Additionally, there would be no financing fees or interest costs associated with this method, which would maximize the total return on investment of the city’s procurement of the PV system. The downsides of this procurement method are minimal. Under this method, the city would need to operate and maintain the system, or alternatively hire a company to perform these services on behalf of the city which would require an ongoing (though small) cost to the city. The city would also need to have enough available capital to directly fund the project.

A TELP funding model utilizes a tax-exempt lease for acquiring the capital necessary for construction and paying this lease back over time. Typically, these agreements run for 15-to-20-year terms. This financing format provides the city multiple benefits – direct capital funding from the city is not required for this financing method, and the model can be structured to ensure that the lease payments are funded by the cost savings from the PV arrays. Additionally, the city can negotiate a fixed interest rate on the borrowed funds and have a predictable payment schedule over time to repay the lease. Under this financing structure, the city is also able to monetize the direct pay credit from the federal government. There are multiple drawbacks to this financing mechanism, however. When utilizing a tax-exempt financing method under the Inflation Reduction Act, the direct pay credits are reduced by 15% relative to a cash purchase option (i.e. the 40% credit described above is reduced to 34%.) In addition, the city would own the arrays and would therefore receive all of the benefits of the system (including RECs) directly, but would need to operate and maintain the systems or hire a company to perform these services to keep the arrays functioning optimally over time which would require an ongoing cost to the city. Additionally, the interest associated with this financed procurement method would reduce the total return on investment of the project relative to a cash-purchase option.

A power purchase agreement (PPA) is an alternative financing option which utilizes a third party to provide the capital necessary for construction of the project. The third party retains ownership of the arrays and the city then pays the third party a negotiated value for the energy produced by the arrays as measured by an electrical meter on site. Term length for this financing option can range significantly, though this is typically on the order of 20 to 30 years. PPA agreements typically encompass two independent variables which determine the base energy price in the agreement, which are term length and escalation rate (the year-over-year increase in the base energy price.) These variables can be adjusted to meet the needs of the city – increasing the term length and escalation rates typically results in a lower base (first-year) PPA rate, increasing savings realized in the early years of the project life cycle. There are several benefits to this financing format – the city would not require any capital to construct the arrays, would not accrue interest during the construction period, and would not incur any direct debt. The city would not own the arrays during the PPA term (though PPAs would typically include an option for the city to procure the array at the end of the term of the agreement), and therefore would not need to orchestrate operations and maintenance activities for the PV systems. Because payments under a power purchase agreement are based around a value per kilowatt-hour of energy delivered to the project site, typical issues impacting energy production would reduce the amount owed by the city to the PPA provider, insulating the city from risk of the systems encountering operational issues; this also keeps the PPA provider's interests aligned with the city's, as the PPA provider is incentivized to maintain the arrays in peak condition to ensure the maximum amount of energy is delivered to the site. This financing method also has downsides; the array being owned by a third party means that the city would not be able to monetize the direct pay credit from the federal government for the project. Additionally, payments from the city to the PPA provider can fluctuate due to weather conditions, etc., and are likely less predictable than payments under a TELP financing model.

These financial vehicles can also be combined to provide additional options for the city. For instance, available capital can be utilized to fund a project, with any shortfall being covered by a TELP or PPA. Combining available capital with a financing option has the benefit of expanding the ability of the city to procure the systems, while significantly reducing the interest paid on a potential lease, or the base price for energy, the annual escalator, or the term negotiated under a PPA.

1.4 Portfolio Cash Flow Models

Each of the project locations was modeled to depict the estimated cash flow provided by each of the various financing strategies described in the previous section of this report. In addition, the portfolio as a whole was modeled similarly to show the revenue potential of the entire project throughout its life cycle. All project financing models anticipate 20-year financing terms to align with the NEM2 project lock-in duration. The impact of changing to the NEM3 tariff after 20 years is included in the following cash flow models and summary tables.

Site Name	Nominal Array Size (kW DC)	Estimated Year 1 Net Savings[1] (Cash)	Estimated Year 1 Net Savings[1] (TELP)	Estimated Year 1 Net Savings[1] (PPA)	Estimated Lifecycle Net Savings (Cash)	Estimated Lifecycle Net Savings (TELP)	Estimated Lifecycle Net Savings (PPA)
Blackberry Farm	73.08	$36,129	-$8,043	-$13,841	$810,224	$231,451	$275,870
Community Hall	49.30	$27,912	$18,887	$11,245	$1,034,175	$806,620	$862,561
Library	422.82	$178,508	$34,139	-$12,967	$7,797,315	$5,452,794	$5,767,273
Quinlan Community Center / Senior Center	311.46	$146,135	$70,776	$24,761	$5,304,691	$3,798,254	$4,016,931
Sports Center	214.02	$87,697	$19,681	-$4,097	$2,962,378	$1,834,598	$1,987,284
Total	1,070.68	$476,381	$135,440	$5,101	$17,908,783	$12,123,717	$12,909,919

[1]Net savings depicted in the above table take into account all estimated elements of the project, incorporating utility bill savings, operations and maintenance costs, interest costs, and PPA payments (as applicable to each of the individual financing mechanisms.)

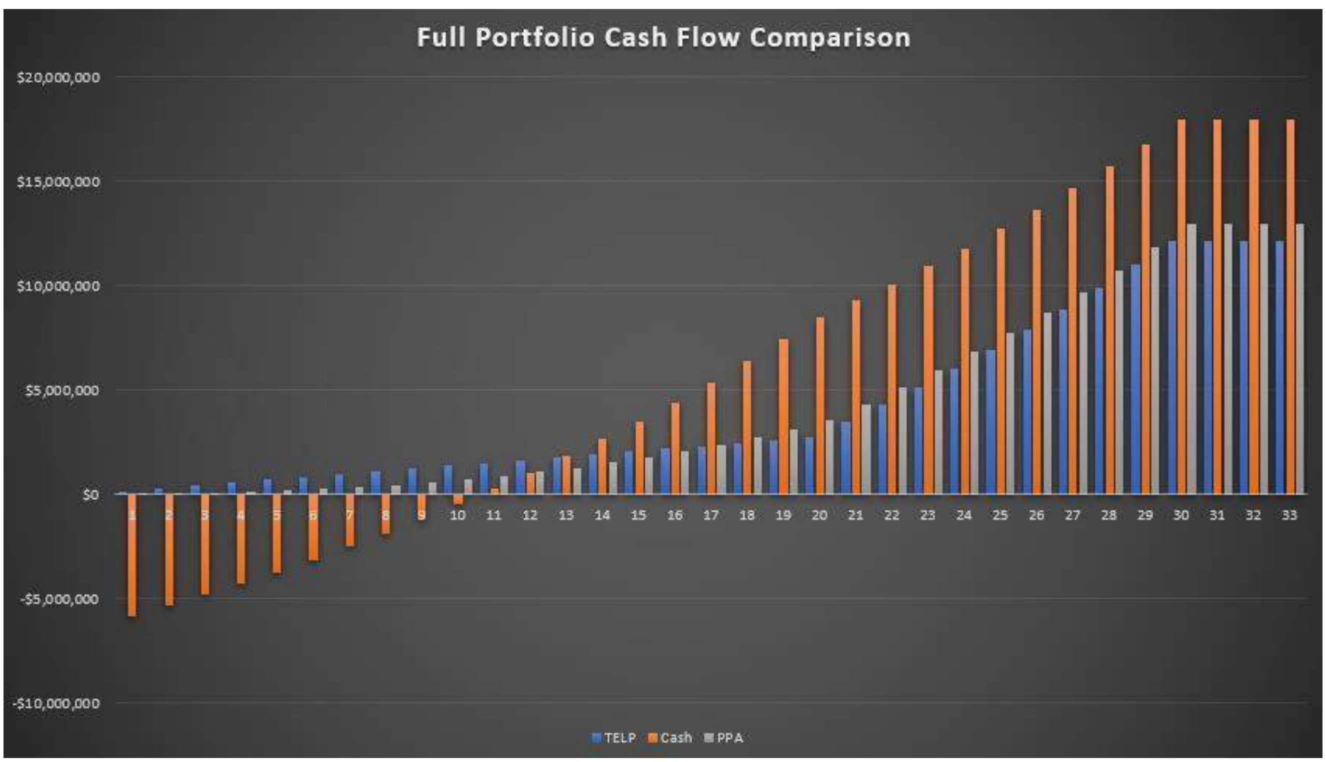
Utilizing a cash purchase model to procure the system provides the highest return on investment for solar PV projects, as there are no PPA payments, financing costs, or accrued interest that need to be paid over time for the system. While this method does require significant capital to be available to procure the system outright, it maximizes the value derived from the system by the purchaser.

When capital is not available or opportunity costs are too significant to justify the short-term expenditure, financing projects via a TELP or PPA (in most cases) provides an excellent opportunity to be able to procure the system while realizing immediate positive cash flow on the project. The downside of these options is that the various financing related payments reduce the life cycle savings of the project significantly, as they are covered by the savings the systems generate.

Full Portfolio Cash Flow Model

Portfolio Financial Summary			
Financing Mechanism	Up Front Costs	Payback Period / Break Even Point	Estimated Lifecycle Net Savings
Cash Purchase	$9,994,000	10.66 Years	$17,908,783
TELP	$0	N/A	$12,123,717
PPA	$0	N/A	$12,909,919

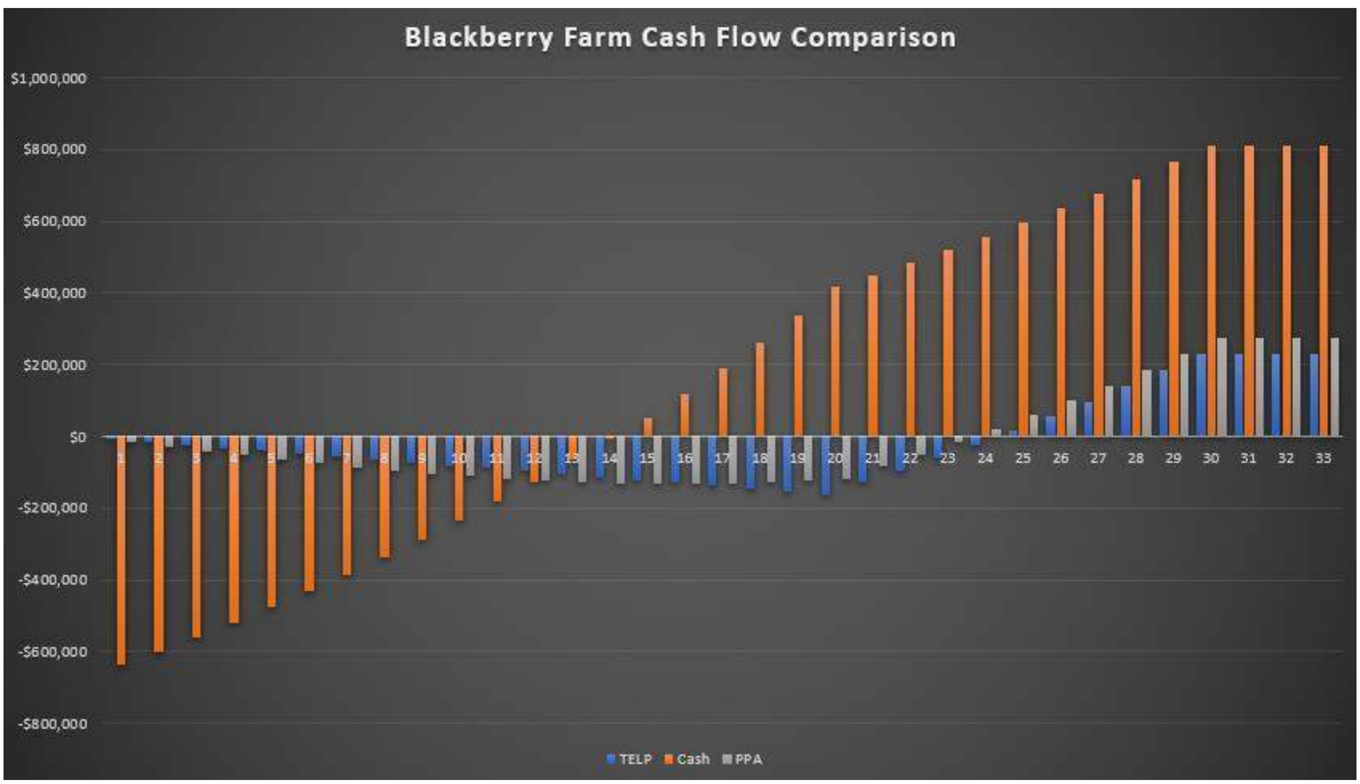
The project portfolio provides an excellent opportunity to bundle all of the locations together to leverage any of the available financing methods and take advantage of the benefits that are most attractive to the city. In a cash purchase setting, the systems are anticipated to pay for themselves in 10.66 years and provide a net lifecycle savings to the city roughly $5 million greater than a financed option. However, both financed options are estimated to be able to provide the city a positive cash flow from the first year of operation, without requiring available capital to purchase the arrays. The modeled cash flow for all three options is shown in the graph below:



Blackberry Farm Cash Flow Model

Blackberry Farm Financial Summary			
Financing Mechanism	Up Front Costs	Payback Period / Break Even Point	Estimated Lifecycle Net Savings
Cash Purchase	$1,056,000	14.08 Years	$810,224
TELP	$0	N/A	$231,451
PPA	$0	N/A	$275,870

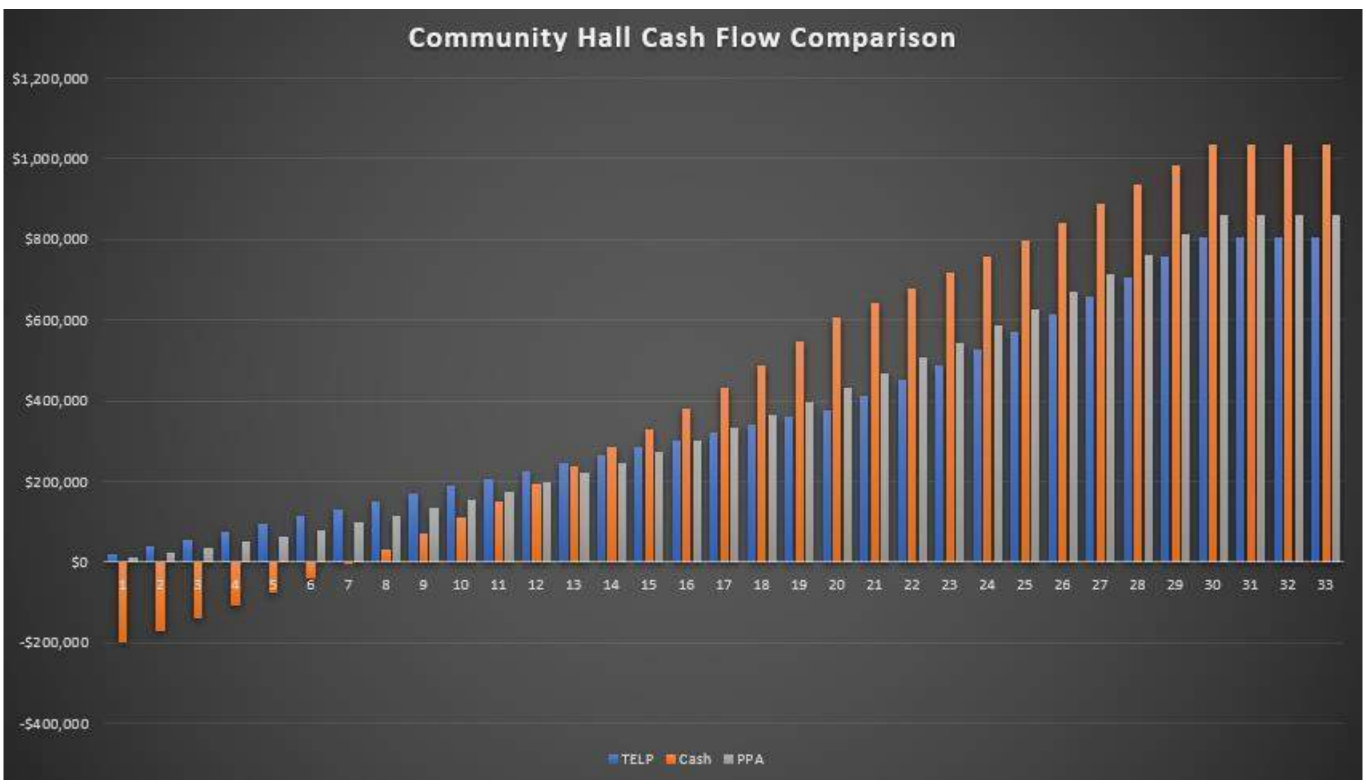
As a standalone project, the Blackberry Farm location is not ideal for leveraging a financed option to procure the system, as the anticipated costs for financing over a 20-year agreement term exceed the projected savings at this location. However, In a cash purchase setting the system is anticipated to pay for itself in 14.08 years, and provide lifecycle savings of more than $800,000. The modeled cash flow for all three options is shown in the graph below:



Community Hall Cash Flow Model

Community Hall Financial Summary			
Financing Mechanism	Up Front Costs	Payback Period / Break Even Point	Estimated Lifecycle Net Savings
Cash Purchase	$377,000	7.15 Years	$1,034,175
TELP	$0	N/A	$806,620
PPA	$0	N/A	$862,561

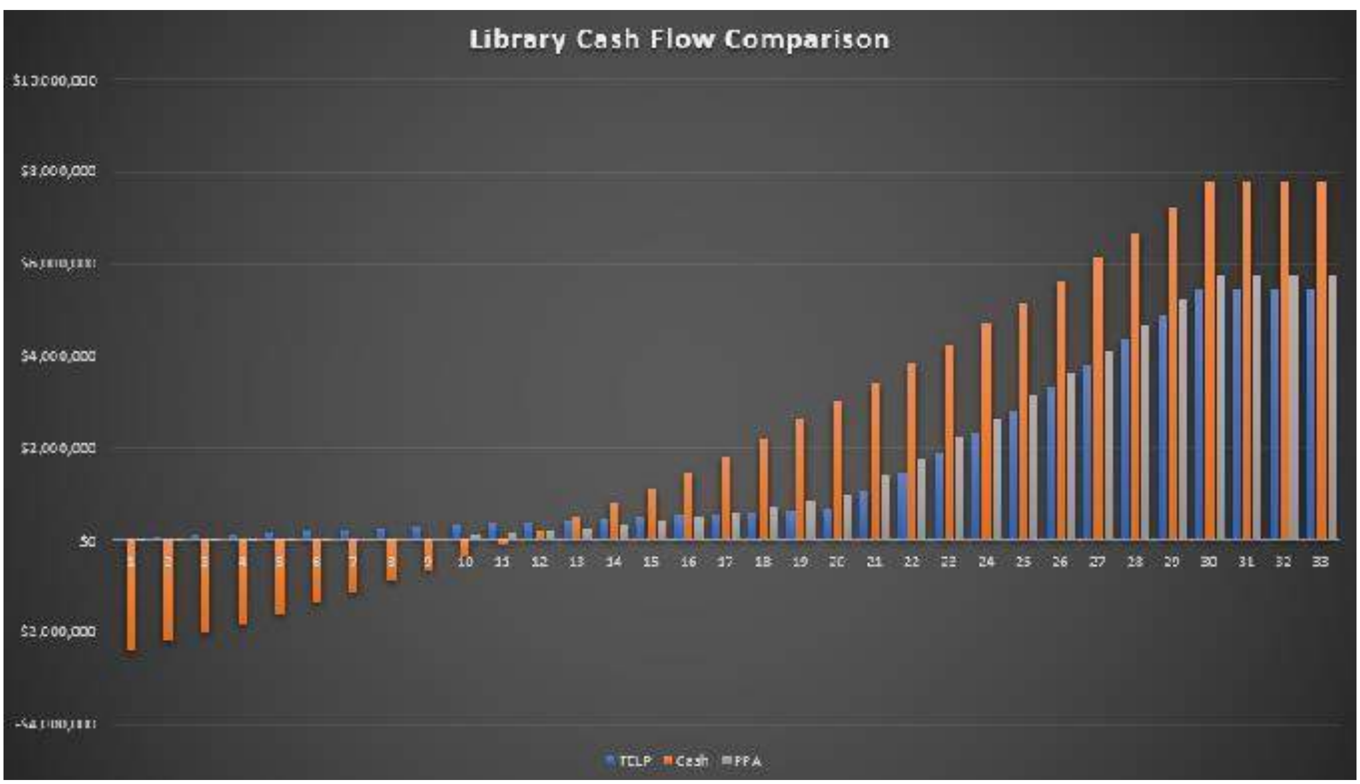
The Community Hall project location provides an excellent opportunity to leverage any of the available financing methods to take advantage of the benefits that are most attractive to the city. In a cash purchase setting, the system is anticipated to pay for itself in 7.15 years and provide a net lifecycle savings to the city roughly $170,000 greater than a financed option. However, both financed options are estimated to be able to provide the city a positive cash flow from the first year of operation without requiring available capital to purchase the arrays. The modeled cash flow for all three options is shown in the graph below:



Library Cash Flow Model

Library Financial Summary			
Financing Mechanism	**Up Front Costs**	**Payback Period / Break Even Point**	**Estimated Lifecycle Net Savings**
Cash Purchase	$4,103,000	11.33 Years	$7,797,315
TELP	$0	N/A	$5,452,794
PPA	$0	N/A	$5,767,273

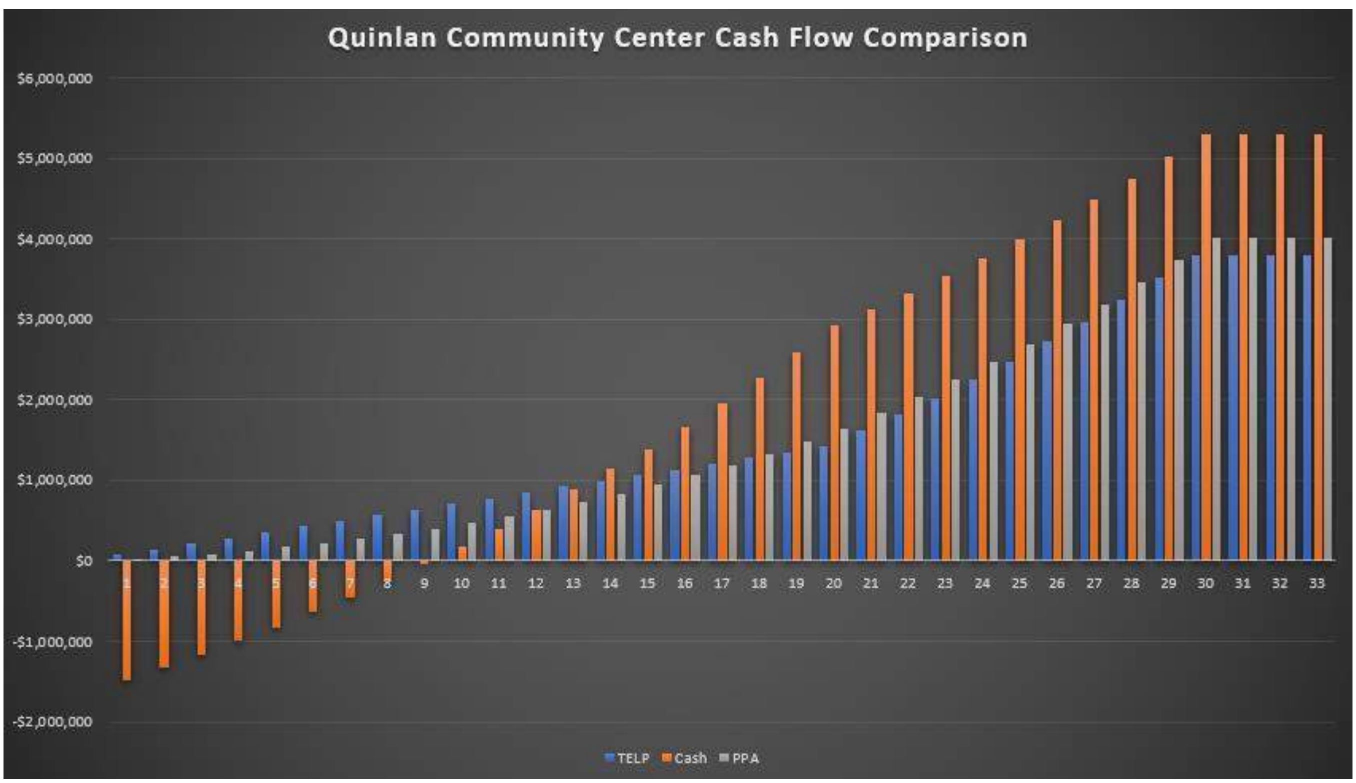
The Library project location provides an opportunity to utilize any of the available financing methods to take advantage of the benefits that are most attractive to the city. In a cash purchase setting, the system is anticipated to pay for itself in 11.33 years and provide a net lifecycle savings to the city roughly $2 million greater than a financed option. However, both financed options are estimated to be able to provide the city a roughly neutral cash flow from the first year of operation, without requiring available capital to purchase the arrays. While the estimated PPA inputs utilized in this model anticipate a slightly negative cash flow in the first year of the project, the term length and PPA escalation rate can be fine tuned to provide a positive cash flow from the outset (though this will likely reduce the corresponding life cycle savings.) The modeled cash flow for all three options is shown in the graph below:



Quinlan Community Center / Senior Center Cash Flow Model

Quinlan Community Center / Senior Center Financial Summary			
Financing Mechanism	Up Front Costs	Payback Period / Break Even Point	Estimated Lifecycle Net Savings
Cash Purchase	$2,493,000	9.21 Years	$5,304,691
TELP	$0	N/A	$3,798,254
PPA	$0	N/A	$4,016,931

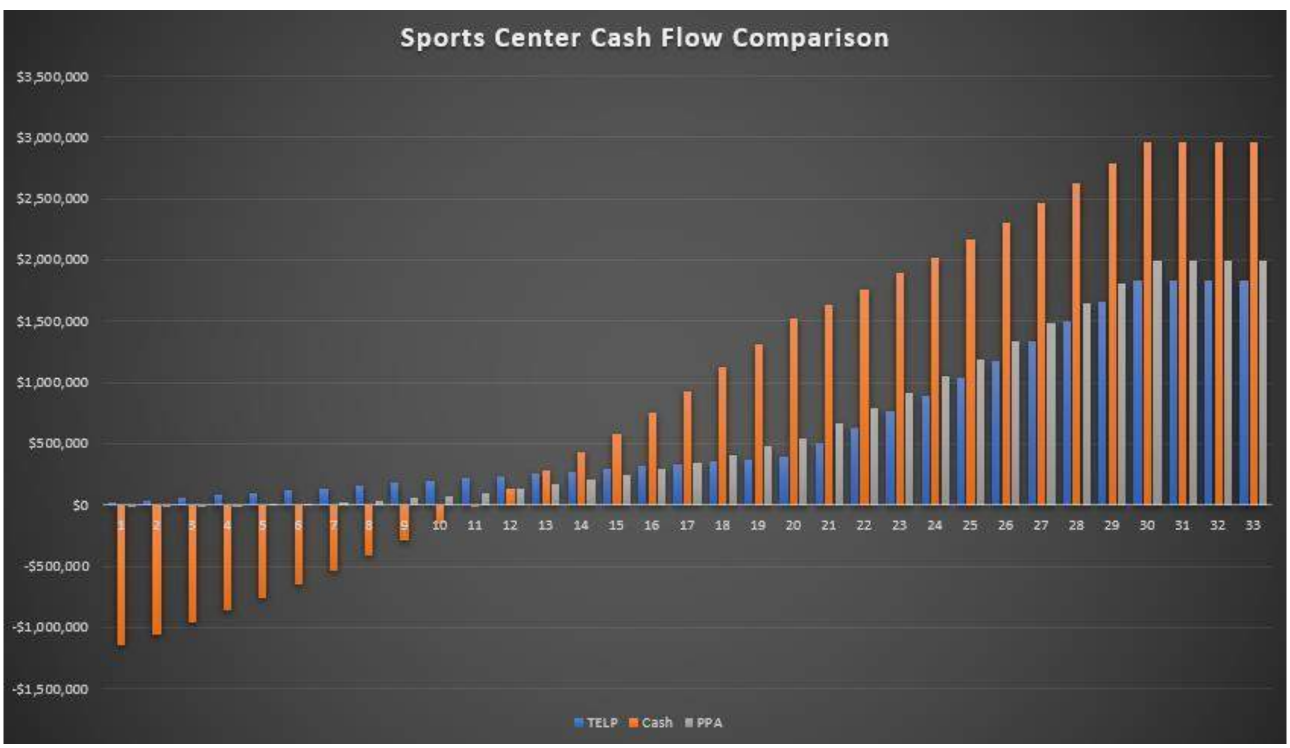
The Quinlan Community Center project location provides an excellent opportunity to leverage any of the available financing methods to take advantage of the benefits that are most attractive to the city. In a cash purchase setting, the system is anticipated to pay for itself in 9.21 years and provide a net lifecycle savings to the city roughly $1.3 million greater than a financed option. However, both financed options are estimated to be able to provide the city a positive cash flow from the first year of operation, without requiring available capital to purchase the arrays. The modeled cash flow for all three options is shown in the graph below:



Sports Center Cash Flow Model

Sports Center Financial Summary			
Financing Mechanism	Up Front Costs	Payback Period / Break Even Point	Estimated Lifecycle Net Savings
Cash Purchase	$1,965,000	11.11 Years	$2,962,378
TELP	$0	N/A	$1,834,598
PPA	$0	N/A	$1,987,284

The Sports Center project location provides an opportunity to utilize any of the available financing methods to take advantage of the benefits that are most attractive to the city. In a cash purchase setting, the system is anticipated to pay for itself in 11.11 years and provide a net lifecycle savings to the city roughly $1 million greater than a financed option. However, both financed options are estimated to be able to provide the city a roughly neutral cash flow from the first year of operation without requiring available capital to purchase the arrays. While the estimated PPA inputs utilized in this model anticipate a slightly negative cash flow in the first year of the project, the term length and PPA escalation rate can be fine tuned to provide a positive cash flow from the outset (though this will likely reduce the corresponding life cycle savings.) The modeled cash flow for all three options is shown in the graph below:



NEM 2 and NEM 3 Comparison

As a part of this project, interconnection applications were submitted to the utility prior to the April 15, 2023 deadline for the closing of NEM2 to new applications for the 5 locations covered in this report. The relative value of the NEM2 projects is significantly greater than if these projects were to be completed under the currently-existing utility tariff structure of NEM3, which will require the systems to be completed by April 15th, 2026. The savings projections under NEM3 were modeled in an analogous manner to the NEM2 savings projections, utilizing an Energy Toolbase model based on a Helioscope array design for each project location, to ensure that the impacts of TOU rate schedules and values for energy exported to the utility grid were accounted for. The same assumptions for utility cost escalation rates (5%) and PV module degradation (0.5%) were utilized in both models. The projected net life cycle savings of the projects are shown under both NEM2 and NEM3 scenarios for comparison in the table below:

Site Name	Nominal Array Size (kW DC)	Estimated Year 1 Net Savings (Cash, NEM2)	Estimated Year 1 Net Savings (Cash, NEM3)	Estimated Lifecycle Net Savings (Cash, NEM2)	Estimated Lifecycle Net Savings (Cash, NEM3)	Energy Offset Percentage
Blackberry Farm	73.08	$36,129	$15,183	$810,224	$156,047	97.01%
Community Hall	49.30	$27,912	$16,699	$1,034,175	$683,968	67.38%
Library	422.82	$178,508	$158,573	$7,797,315	$7,174,859	62.89%
Quinlan Community Center / Senior Center	311.46	$146,135	$80,666	$5,304,691	$3,260,036	87.54%
Sports Center	214.02	$87,697	$46,947	$2,962,378	$1,689,711	96.54%
Total	1,070.68	$476,381	$318,068	$17,908,783	$12,964,621	76.76%

The impact of the NEM3 tariff relative to the NEM2 tariff for each of the project locations varies significantly. On average, NEM3 drastically reduces the credit earned for exporting energy from the project locations to the utility grid, though it has no impact on energy that is produced and consumed concurrently on site. As a result of this, locations that utilize most of their energy during the day (particularly in the summer months) are not as heavily impacted by the NEM3 tariff as sites whose energy usage is not aligned with available sunlight. For a given site, as the fraction of energy usage offset by the PV system rises, the impact of NEM3 will generally also increase. For this portfolio, the impact of NEM3 on the proposed systems varies significantly, ranging from an 11.17% reduction in first year savings at the Library to a 57.98% reduction in first year savings at the Blackberry Farm location. Across the entire portfolio, NEM3 would reduce first year energy savings by 33.23% when compared with the same project under NEM2. The lifecycle net savings discrepancy across the portfolio (27.61%) is slightly lower than the first-year savings discrepancy, as the NEM 2 projects will be transitioned to NEM3 after 20 years, at which point the annual savings of both scenarios will equalize.

Section 2 – Construction Methodology, Equipment, and Conceptual Designs

2.1 Construction Methodology and Schedule

Design-Build Construction Methodology Benefits

Syserco Energy Solutions recommends a design-build methodology for execution of this project, which is common in the solar industry. There are a significant number of benefits to this delivery method, which are particularly valuable in a time-constrained environment. Given the need to complete these projects by the April 15th, 2026 deadline to maintain NEM2 status for the arrays, timing will be critical for the success of the project. The benefits of a design-build methodology are summarized below:

Complete Accountability – With the design-build delivery method, a single entity, the design-builder, is the point of accountability across the entire project. The Design-Builder is always working toward the owner's project goals with intent. The entire process, from design to final walkthrough, requires the Design-Builder to take full responsibility for all aspects of the project. Details and "Scope Gaps" cannot be overlooked without accountability.

Quality of the design – Allows for Owner input and accounts for all project-related costs

Improved Continuity - In the traditional "Design-Bid-Build" project delivery, once the design team completes their work, they hand off the project to a general contractor, who may have a different perspective on the project than the design team. Unless all elements of the project are fully and minutely detailed, there may be discrepancies between the design intent and the fully executed project. With design-build projects, a seamless line exists between each phase of the construction process, aligning all parts of the project team towards a common design and implementation intent.

Single Project Leader, Single POC – A Design-Build Project Manager is part of everything from planning to the final stages. They're in charge of keeping things on time, planned, and on budget.

Field Expertise & Early Collaboration – Expertise for all areas of project development and construction are involved from start to finish. Design engineers work with construction-focused minds to ensure what is being designed can actually be built in the field, without additional surprises and cost increases.

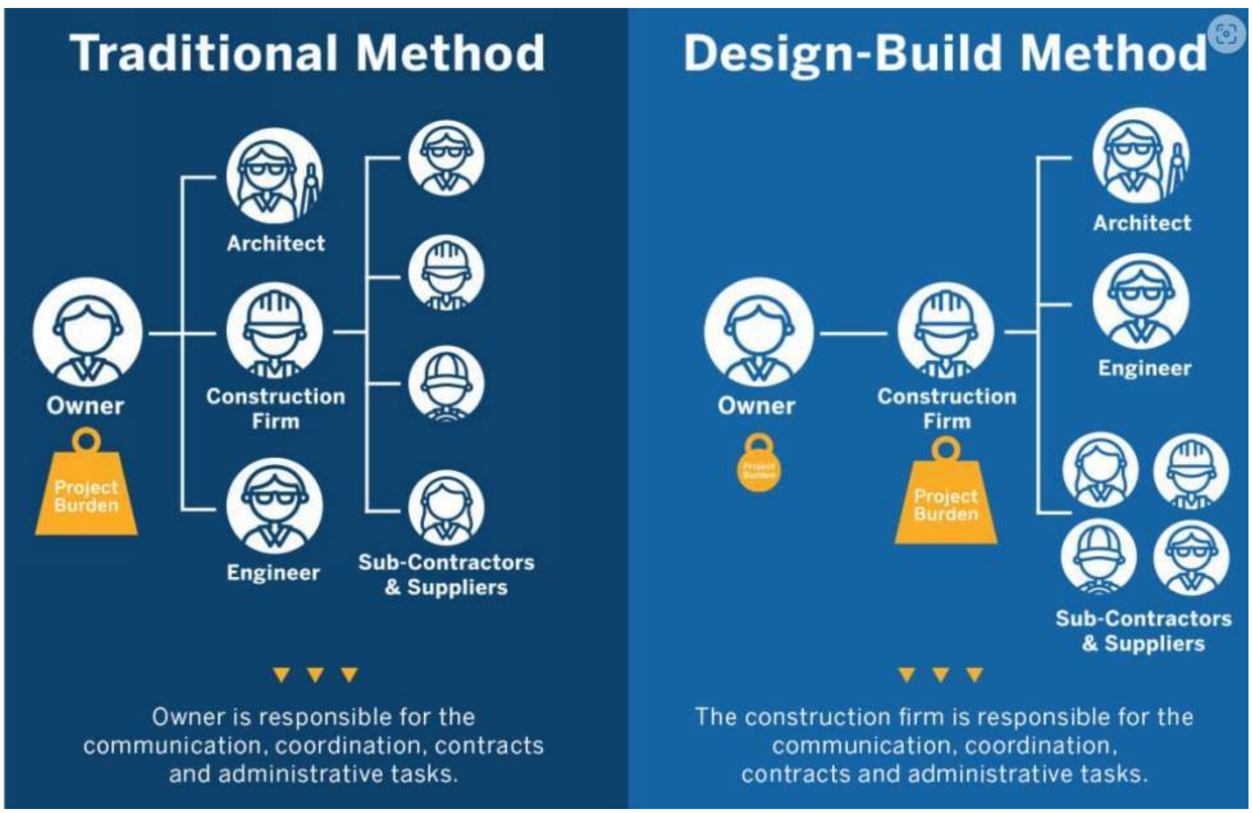
Risk Mitigation - Much of the risk involved in a project using the design-build method falls away from the owner to the design-build contractor. As a result, owners are often better protected against unexpected costs resulting from design errors or construction delays.

Single Contract – A single design-build contract eliminates (sometimes challenging) contract negotiations between engineering firms, construction firms, and commissioning firms. Instead of multiple contracts, the design-builder will have one singular agreement with the owner. As a result, the owner retains control, while an environment of collaboration produces exceptional results without regular construction hangups.

Streamlined Communication - Communication is critical to keeping projects on budget and on time. Design-build cuts out inefficiencies by putting everyone on the same team. When designers, contractors, and other workers are on the same team, getting information from one person to another is seamless and fast. Instead of needing to coordinate multiple entities that may operate on different schedules, the design-build team can react quickly to any issues that may arise during the project.

Financial Savings - It's easy to assume that one of the benefits of design-bid-build is a lower budget, because projects often go to the lowest bidder. While a lower budget might be alluring, the inefficiencies and disconnects inherent in the traditional approach can create financial burdens. Keeping projects on budget is difficult and made even more complex by a lack of communication and accountability.

Time Savings - When teams work in step with each other, rather than solely sequentially, it means you can save time and budget time more effectively. Many project owners have an experience of waiting weeks (or even months) after the design phase to break ground and start construction. Using a design-build approach means you aren't waiting on another company to start on the next stage.



Equipment Changes – The solar industry moves very quickly, and solar modules in particular are constantly subject to shifting availability as new module models and wattages come onto the market (and older modules stop being produced). Performing a detailed DC electrical design based on specific modules well in advance of the project's procurement and construction phases presents significant risk of alterations being needed. Alterations under a design-bid-build model impose an appreciable risk of delay, as the project engineer would need to be reengaged to review and update the DC electrical design to accommodate module changes.

Design-Build Estimated Project Schedule

The major milestones of the estimated schedule required to implement a design-build procurement of the project portfolio by the April 15th, 2026 NEM2 deadline is summarized in the table below:

Event	Target Date
Contract Issued	January 14th, 2025
Project Engineering / Detailed Design Phase	January 15th, 2025 – April 1st, 2025
Permitting	April 1st, 2025 – May 1st, 2025
Procurement of Major Materials	March 1st, 2025 – September 1st, 2025
Construction Schedule	September 1st, 2025 – April 1st, 2026

2.2 Project Portfolio Conceptual Designs

Conceptual designs for each of the projects are shown on the following pages. For each project location, a Helioscope conceptual system design and a single line diagram have been provided, depicting the system layout, electrical components, and anticipated electrical configuration. These conceptual designs are indicative of the design intent for each of the projects, though alternative system designs (equipment manufacturers and models, inverter voltages, etc.) could be utilized to provide similar value to the city.

Maintaining the existing trees on site is a priority for this project, though several trees will need to be removed from the library and sports center site locations where conflicting with the array locations and where necessary to ensure appropriate solar access for the new solar arrays. Where possible, tree trimming is recommended in place of tree removal at the library and sports center sites. Tree trimming is additionally recommended at the Quinlan Community Center and Blackberry farm sites, though no trees will be removed from these locations as part of this project – the trees conflicting with the array located in the picnic area of the Quinlan Community Center are assumed to be removed or replanted as part of the Memorial Park revitalization project. The number of trees that will need to be removed and are recommended to be trimmed at each site is summarized in the table below:

Site Name	Trees to be Trimmed	Trees to be Removed
Blackberry Farm	1	0
Community Hall	0	0
Library	0	31
Quinlan Community Center / Senior Center	9	0
Sports Center	2	5
Total	12	36

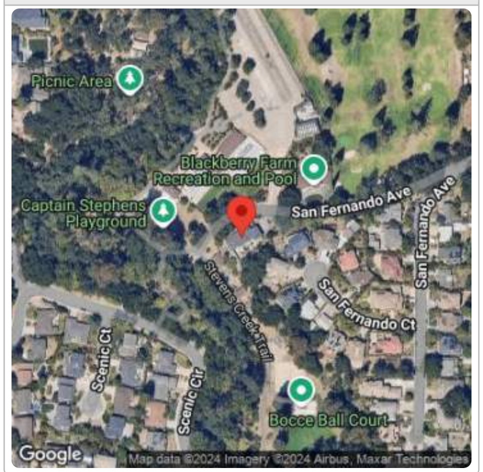
Blackberry Farm Conceptual Design

Blackberry Farm Carport Cupertino - Blackberry Farm, 21975 San Fernando Ave, Cupertino, CA 95014

Design

Design	Blackberry Farm Carport
DC Nameplate	73.1 kW
AC Nameplate	60.0 kW (1.22 DC/AC)
Last Modified	Taylor Bohlen (Today at 10:26 PM)

Project Location



Components

Component	Name	Count
Inverters	S6-GC60K-US (Solis)	1 (60.0 kW)
Strings	10 AWG (Copper)	8 (712.9 ft)
Optimizers	TS4-A-O (Tigo Energy)	126 (88.2 kW)
Module	Heliene Inc, 156HC-580 M10 SL Bifacial (580W)	126 (73.1 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1 (copy 1)	Carport	Portrait (Vertical)	7°	241.43607°	1.6 ft	3x42	1	126	73.1 kW

Wiring Zones

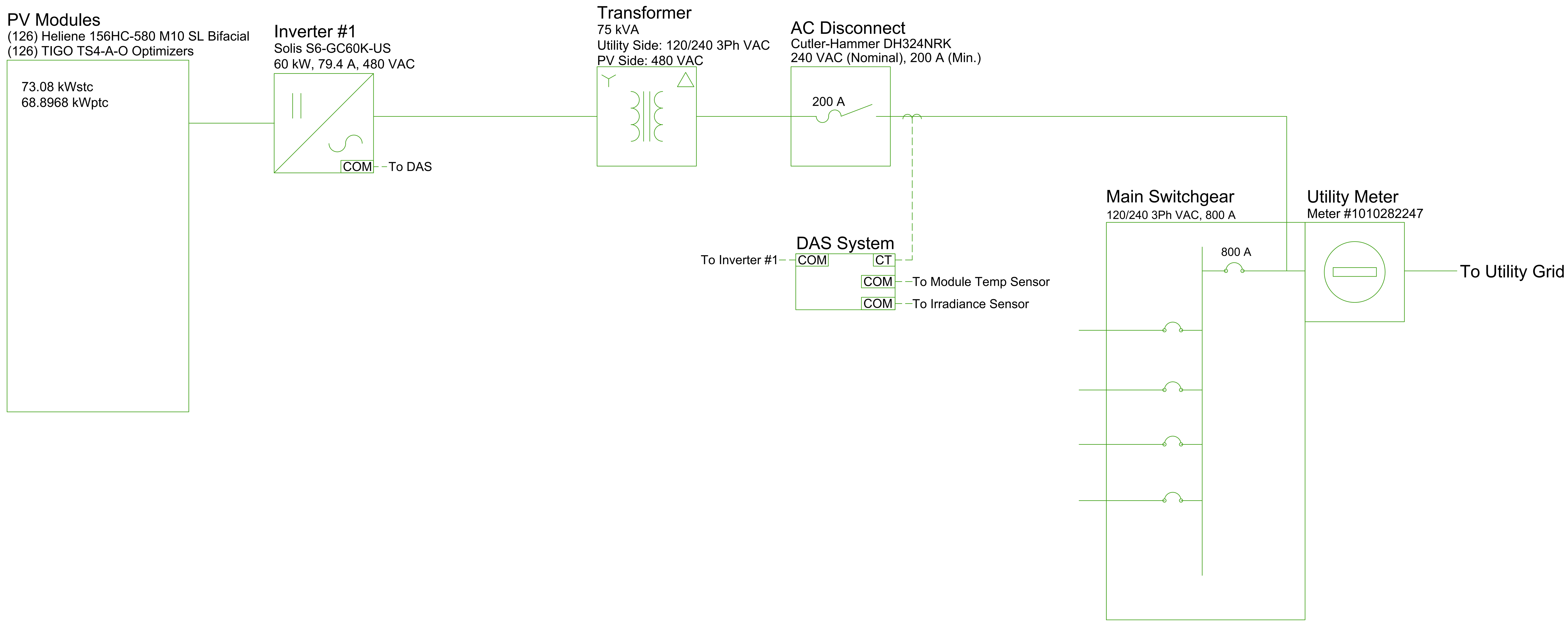
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	4-17	Along Racking

Detailed Layout2

Cupertino - Blackberry Farm Recreation

Module Specifications	
Heliene 156HC-580 M10 SL Bifacial	
Wattage (STC)	580
Wattage (PTC)	546.8
V_{oc}	54.13
V_{mp}	45.64
I_{sc}	13.48
I_{mp}	12.7
V_{oc} %/°C	-0.25%
Voltage Max.	1500
Quantity	126

Inverter Specifications (Type 1)	
Solis S6-GC60K-US	
Kilo Watts	60
Amperage	79.4
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	4
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1



Contractor:
SYSERCO ENERGY SOLUTIONS
215 Fourier Avenue
Fremont, CA, 94539
Suite 140

Project Location:
21975 San Fernando Ave
Cupertino, CA 95014
AHJ: Cupertino, City of

Project Details:
73.08 kWstc, 60 kWAC
67.86 kW CEC-AC
Utility: PG&E

Revision History:

Rev #	Date	Description
1	3/3/2023	Original
2	8/28/2024	Equipment
3	9/4/2024	Equipment
4	11/6/2024	Equipment

Engineering Approval:

Community Hall Conceptual Design

Community Hall Rooftop Cupertino - Civic Center, 10300 TORRE AVE

Design

Design	Community Hall Rooftop
DC Nameplate	49.3 kW
AC Nameplate	50.0 kW (0.99 DC/AC)
Last Modified	Taylor Bohlen (09/24/2024)

Project Location

Components

Component	Name	Count
Inverters	S6-GC50K-US (Solis)	1 (50.0 kW)
Strings	10 AWG (Copper)	5 (372.1 ft)
Module	Heliene Inc, 156HC-580 M10 SL Bifacial (580W)	85 (49.3 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 6	Flush Mount	Portrait (Vertical)	15°	90°	0.0 ft	1x1	34	34	19.7 kW
Field Segment 7	Flush Mount	Portrait (Vertical)	15°	270°	0.0 ft	1x1	40	40	23.2 kW
Field Segment 8	Flush Mount	Portrait (Vertical)	15°	180.02425°	0.0 ft	1x1	11	11	6.38 kW

Wiring Zones

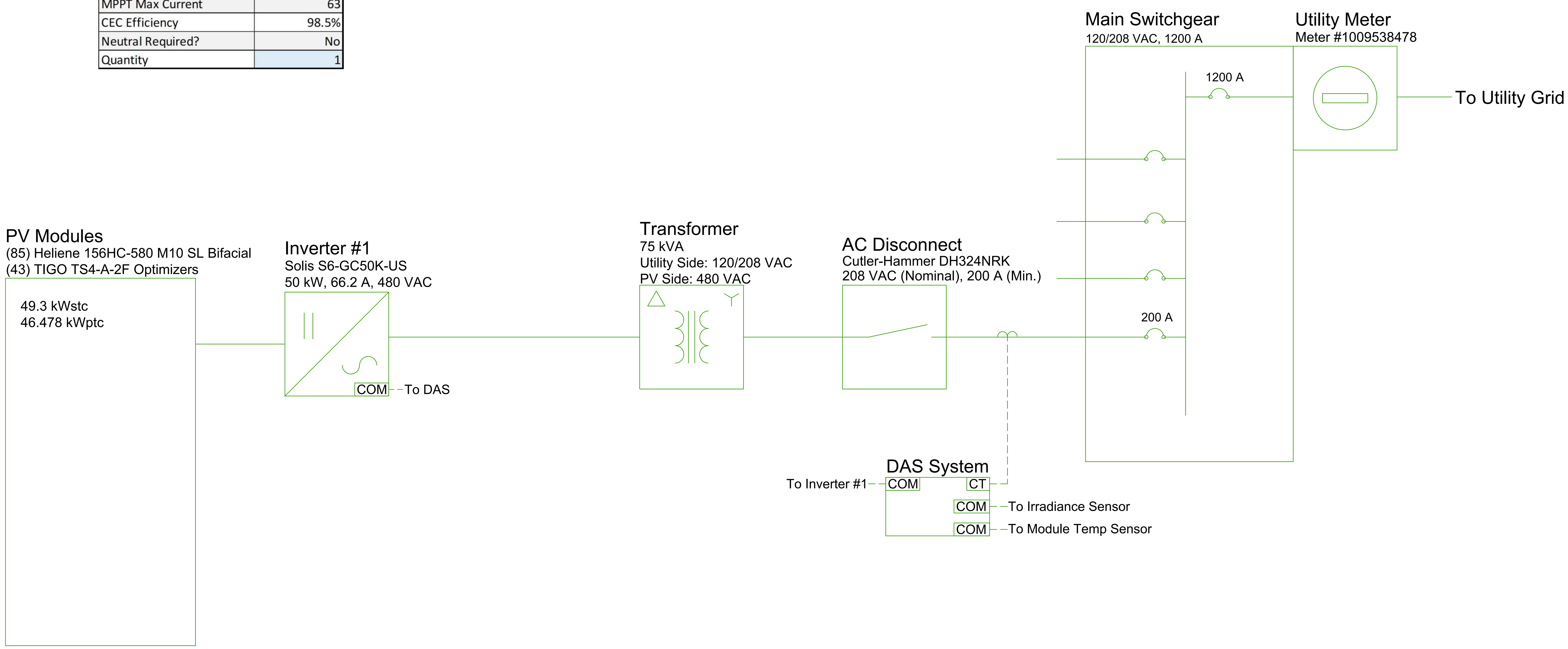
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	-	Along Racking
Wiring Zone 2	-	-	Along Racking
Wiring Zone 3	-	4-17	Along Racking
Wiring Zone 4	-	-	Along Racking

Detailed Layout

City of Cupertino - Community Hall

Module Specifications	
Heliene 156HC-580 M10 SL Bifacial	
Wattage (STC)	580
Wattage (PTC)	546.8
V_{oc}	54.13
V_{mp}	45.64
I_{sc}	13.48
I_{mp}	12.7
V_{oc} %/°C	-0.25%
Voltage Max.	1500
Quantity	85

Inverter Specifications (Type 1)	
Solis S6-GC50K-US	
Kilo Watts	50
Amperage	66.2
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	4
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1



Contractor:

SYSERCO ENERGY SOLUTIONS

215 Fourier Avenue
Fremont, CA, 94539
Suite 140

Project Location:
10350 Torre Avenue
Cupertino, CA 95014
AHJ: Cupertino, City of

Project Details:
49.3 kWstc, 50 kWAC
45.78 kW CEC-AC
Utility: PG&E

Revision History:

Rev #	Date	Description
1	3/3/2023	Original
2	8/9/2024	DAS
3	8/28/2024	Equipment
4	9/4/2024	Equipment
5	10/10/2024	System Size
6	10/16/2024	Project Name
7	11/6/2024	Equipment

Engineering Approval:

Library Conceptual Design

Library / Civic Center Cupertino - Civic Center, 10300 TORRE AVE

Design

Design	Library / Civic Center
DC Nameplate	422.8 kW
AC Nameplate	403.0 kW (1.05 DC/AC)
Last Modified	Taylor Bohlen (09/24/2024)

Project Location

Components

Component	Name	Count
Inverters	S5-GC75K-US (Solis)	2 (150.0 kW)
Inverters	S6-GC33K-US (Solis)	1 (33.0 kW)
Inverters	S6-GC60K-US (Solis)	2 (120.0 kW)
Inverters	S5-GC100K-US (Solis)	1 (100.0 kW)
Strings	10 AWG (Copper)	49 (5,030.3 ft)
Module	Heliene Inc, 156HC-580 M10 SL Bifacial (580W)	729 (422.8 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 5	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x49	1	147	85.3 kW
Field Segment 4	Flush Mount	Portrait (Vertical)	15°	270°	0.0 ft	1x1	143	143	82.9 kW
Field Segment 3	Fixed Tilt	Landscape (Horizontal)	Module: 10°	Module: 180°	1.6 ft	1x1	34	34	19.7 kW
Field Segment 5 (copy)	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x21	1	63	36.5 kW
Field Segment 5 (copy 1)	Carport	Portrait (Vertical)	7°	270°	1.6 ft	3x47	1	141	81.8 kW
Field Segment 5 (copy 2)	Carport	Portrait (Vertical)	7°	270°	1.6 ft	3x67	1	201	116.6 kW

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	5-17	Along Racking
Wiring Zone 2	-	4-17	Along Racking
Wiring Zone 3	-	5-17	Along Racking
Wiring Zone 4	-	5-17	Along Racking
Wiring Zone 5	-	4-17	Along Racking

Detailed Layout

City of Cupertino - Library

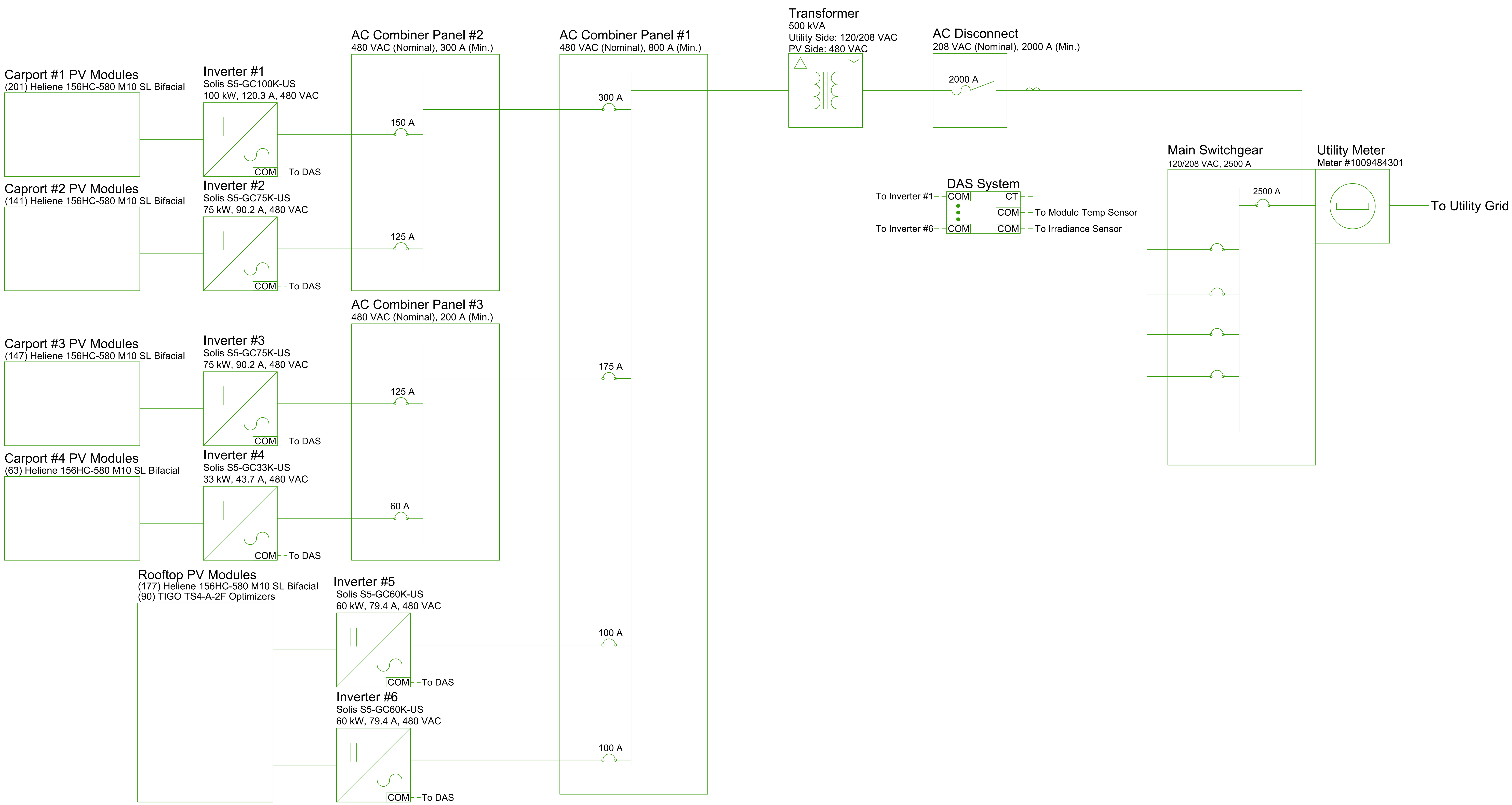
Module Specifications	
Heliene 156HC-580 M10 SL Bifacial	
Wattage (STC)	580
Wattage (PTC)	546.8
V_{oc}	54.13
V_{mp}	45.64
I_{sc}	13.48
I_{mp}	12.7
V_{oc} %/°C	-0.25%
Voltage Max.	1500
Quantity	729

Inverter Specifications (Type 1)	
Solis S5-GC100K-US	
Kilo Watts	100
Amperage	120.3
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	195
Number of MPPT's	10
Inputs Per MPPT	2
MPPT Max Usable Current	32
MPPT Max Current	50
CEC Efficiency	98.2%
Neutral Required?	No
Quantity	1

Inverter Specifications (Type 2)	
Solis S5-GC75K-US	
Kilo Watts	75
Amperage	90.2
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	195
Number of MPPT's	8
Inputs Per MPPT	2
MPPT Max Usable Current	32
MPPT Max Current	50
CEC Efficiency	98.3%
Neutral Required?	No
Quantity	2

Inverter Specifications (Type 3)	
Solis S6-GC60K-US	
Kilo Watts	60
Amperage	79.4
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	4
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	2

Inverter Specifications (Type 4)	
Solis S6-GC33K-US	
Kilo Watts	33
Amperage	43.7
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	3
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1



Contractor:

SYSERCO ENERGY SOLUTIONS

215 Fourier Avenue
Fremont, CA, 94539
Suite 140

Project Location:
10800 Torre Avenue
Cupertino, CA 95014
AHJ: Cupertino, City of

Project Details:
422.82 kWstc, 403 kWAC
392.04 kW CEC-AC
Utility: PG&E

Revision History:

Rev #	Date	Description
1	3/3/2023	Original
2	8/29/2024	Equipment
3	9/4/2024	Equipment
4	10/10/2024	System Size
5	11/6/2024	Equipment

Engineering Approval:

Quinlan Community Center

Conceptual Design

Quinlan Community Center Cupertino - Quinlan + Senior + Sports Centers, 10185 N STELLING RD cupertino

Design

Design	Quinlan Community Center
DC Nameplate	311.5 kW
AC Nameplate	273.0 kW (1.14 DC/AC)
Last Modified	Taylor Bohlen (Today at 5:25 PM)

Project Location

Components

Component	Name	Count
Inverters	S5-GC90K-US (Solis)	1 (90.0 kW)
Inverters	S6-GC33K-US (Solis)	1 (33.0 kW)
Inverters	S6-GC50K-US (Solis)	1 (50.0 kW)
Inverters	S5-GC100K-US (Solis)	1 (100.0 kW)
Strings	10 AWG (Copper)	35 (3,558.6 ft)
Module	Heliene Inc, 156HC-580 M10 SL Bifacial (580W)	537 (311.5 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x66	1	198	114.8 kW
Field Segment 5	Flush Mount	Landscape (Horizontal)	20°	225.25685°	0.0 ft	1x1	34	34	19.7 kW
Field Segment 7	Flush Mount	Landscape (Horizontal)	20°	270.25943°	0.0 ft	1x1	11	11	6.38 kW
Field Segment 8	Flush Mount	Portrait (Vertical)	20°	134.57349°	0.0 ft	1x1	14	14	8.12 kW
Field Segment 12	Flush Mount	Portrait (Vertical)	20°	135°	0.0 ft	1x1	19	19	11.0 kW
Field Segment 36	Flush Mount	Portrait (Vertical)	20°	180°	0.0 ft	1x1	5	5	2.90 kW
Field Segment 34	Flush Mount	Portrait (Vertical)	20°	270°	0.0 ft	1x1	7	7	4.06 kW
Field Segment 1 (copy)	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x19	1	57	33.1 kW
Field Segment 1 (copy 1)	Carport	Portrait (Vertical)	5°	90°	1.6 ft	6x32	1	192	111.4 kW

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	5-17	Along Racking
Wiring Zone 2	-	4-17	Along Racking
Wiring Zone 3	-	4-17	Along Racking
Wiring Zone 4	-	5-17	Along Racking

Detailed Layout

City of Cupertino - Quinlan Community Center

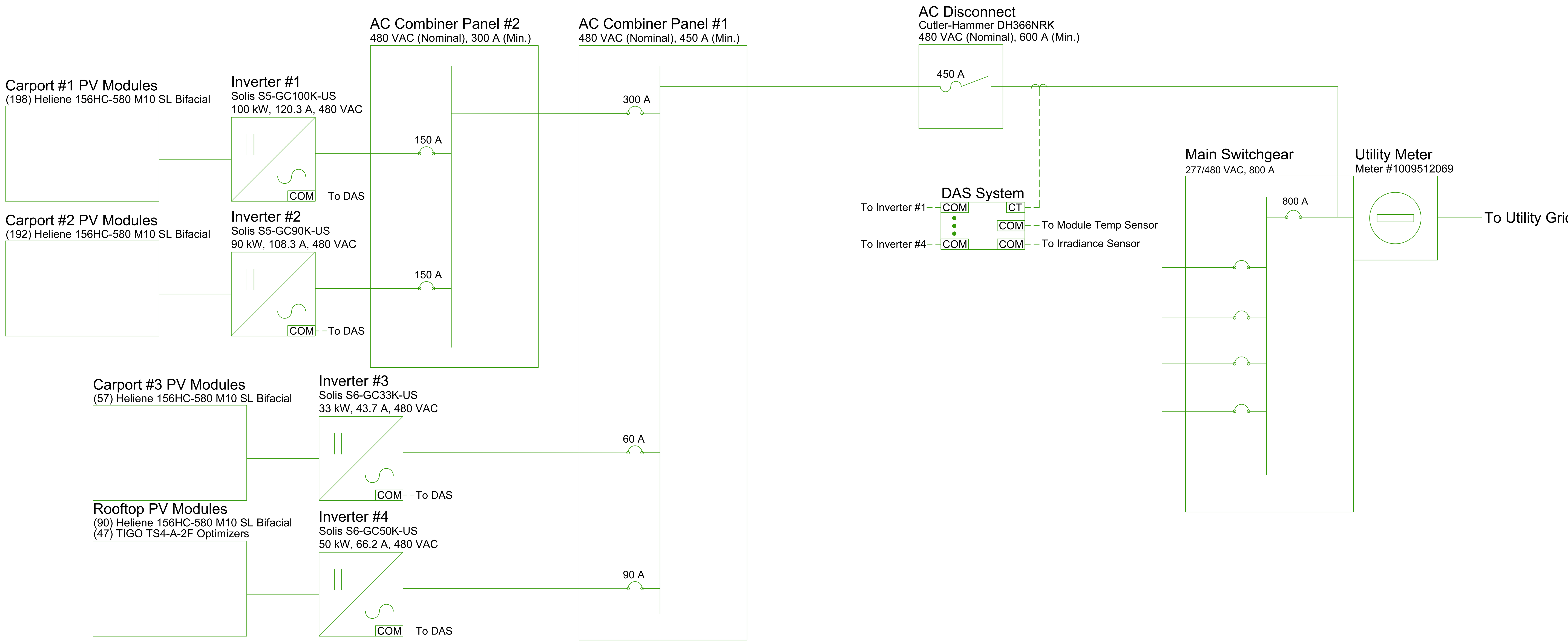
Module Specifications	
Heliene 156HC-580 M10 SL Bifacial	
Wattage (STC)	580
Wattage (PTC)	546.8
V_{oc}	54.13
V_{mp}	45.64
I_{sc}	13.48
I_{mp}	12.7
V_{oc} %/°C	-0.25%
Voltage Max.	1500
Quantity	537

Inverter Specifications (Type 1)	
Solis S5-GC100K-US	
Kilo Watts	100
Amperage	120.3
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	195
Number of MPPT's	10
Inputs Per MPPT	2
MPPT Max Usable Current	32
MPPT Max Current	50
CEC Efficiency	98.2%
Neutral Required?	No
Quantity	1

Inverter Specifications (Type 2)	
Solis S5-GC90K-US	
Kilo Watts	90
Amperage	108.3
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	195
Number of MPPT's	10
Inputs Per MPPT	2
MPPT Max Usable Current	32
MPPT Max Current	50
CEC Efficiency	98.2%
Neutral Required?	No
Quantity	1

Inverter Specifications (Type 3)	
Solis S6-GC50K-US	
Kilo Watts	50
Amperage	66.2
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	4
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1

Inverter Specifications (Type 4)	
Solis S6-GC33K-US	
Kilo Watts	33
Amperage	43.7
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	3
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1



Contractor:

SYSERCO ENERGY SOLUTIONS

215 Fourier Avenue
Fremont, CA, 94539
Suite 140

Project Location:

10185 N Stelling Rd
Cupertino, CA 95014
AHJ: Cupertino, City of

Project Details:

311.46 kWstc, 273 kWAC
288.61 kW CEC-AC
Utility: PG&E

Revision History:

Rev #	Date	Description
1	3/3/2023	Original
2	8/28/2024	Equipment
3	9/4/2024	Equipment
4	11/6/2024	Equipment

Engineering Approval:

Sports Center Conceptual Design

Sports Center Carports Cupertino - Quinlan + Senior + Sports Centers, 10185 N STELLING RD cupertino

Design

Design	Sports Center Carports
DC Nameplate	214.0 kW
AC Nameplate	172.0 kW (1.24 DC/AC)
Last Modified	Taylor Bohlen (09/24/2024)

Project Location

Components

Component	Name	Count
Inverters	S5-GC75K-US (Solis)	1 (75.0 kW)
Inverters	S6-GC25K-US (Solis)	1 (25.0 kW)
Inverters	S6-GC36K-US (Solis)	2 (72.0 kW)
Strings	10 AWG (Copper)	26 (1,628.9 ft)
Module	Heliene Inc, 156HC-580 M10 SL Bifacial (580W)	369 (214.0 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 2 (copy)	Carport	Portrait (Vertical)	7°	270°	1.6 ft	6x27	1	162	94.0 kW
Field Segment 1 (copy)	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x17	1	51	29.6 kW
Field Segment 1 (copy 1)	Carport	Portrait (Vertical)	7°	180°	1.6 ft	3x52	1	156	90.5 kW

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone 2	-	5-17	Along Racking
Wiring Zone 3	-	4-17	Along Racking
Wiring Zone	-	4-17	Along Racking

Detailed Layout

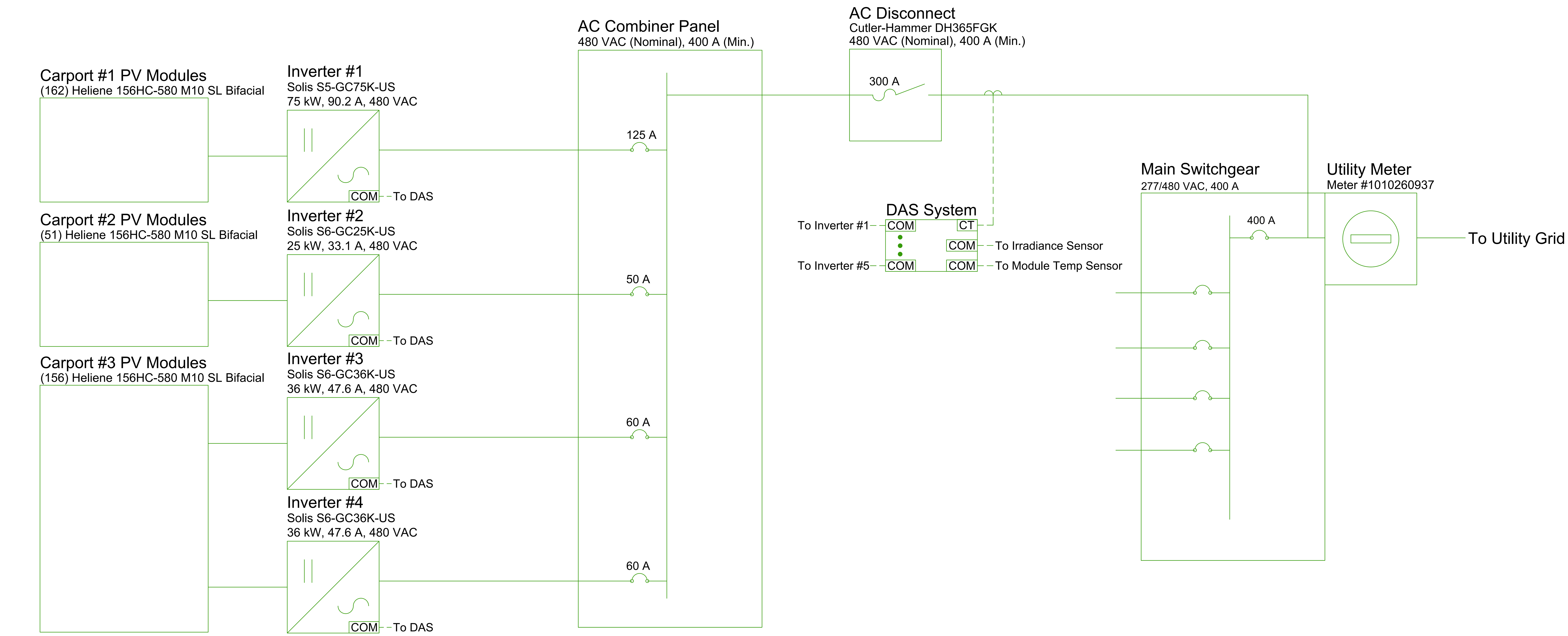
City of Cupertino - Sports Center

Module Specifications	
Heliene 156HC-580 M10 SL Bifacial	
Wattage (STC)	580
Wattage (PTC)	546.8
V_{oc}	54.13
V_{mp}	45.64
I_{sc}	13.48
I_{mp}	12.7
V_{oc} %/°C	-0.25%
Voltage Max.	1500
Quantity	369

Inverter Specifications (Type 1)	
Solis S5-GC75K-US	
Kilo Watts	75
Amperage	90.2
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	195
Number of MPPT's	8
Inputs Per MPPT	2
MPPT Max Usable Current	32
MPPT Max Current	50
CEC Efficiency	98.3%
Neutral Required?	No
Quantity	1

Inverter Specifications (Type 2)	
Solis S6-GC36K-US	
Kilo Watts	36
Amperage	47.6
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	3
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	2

Inverter Specifications (Type 3)	
Solis S6-GC25K-US	
Kilo Watts	25
Amperage	33.1
Voltage	480
Configuration	Delta
Max Input Voltage	1000
Max MPPT Voltage	1000
Min MPPT Voltage	180
Start Up Voltage	180
Number of MPPT's	3
Inputs Per MPPT	2
MPPT Max Usable Current	40
MPPT Max Current	63
CEC Efficiency	98.5%
Neutral Required?	No
Quantity	1



Contractor:

SYSERCO ENERGY SOLUTIONS

215 Fourier Avenue
Fremont, CA, 94539
Suite 140

Project Location:

21111 Stevens Creek Blvd
Cupertino, CA 95014
AHJ: Cupertino, City of

Project Details:

214.02 kWstc, 197 kWAC
198.57 kW CEC-AC
Utility: PG&E

Revision History:

Rev #	Date	Description
1	3/2/2023	Original
2	8/9/2024	System Size
3	8/28/2024	Equipment
4	9/4/2024	Equipment

Engineering Approval:

2.3 Project Equipment Lists

The following is a description of the major materials utilized in the conceptual design for each of the project locations. Note that this equipment is listed to depict the conceptual design intent, and alternative equipment manufacturers and models may be utilized to meet the minimum requirements detailed in this report.

Full Portfolio Equipment List

Cupertino Portfolio Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	1846
Rapid Shutdown / Optimizers	TIGO	TS4-A-2F	180
Rapid Shutdown / Optimizers	TIGO	TS4-A-O	126
Inverters	Solis	S5-GC100K-US	2
Inverters	Solis	S5-GC90K-US	1
Inverters	Solis	S5-GC75K-US	3
Inverters	Solis	S6-GC60K-US	3
Inverters	Solis	S6-GC50K-US	2
Inverters	Solis	S6-GC36K-US	2
Inverters	Solis	S6-GC33K-US	2
Inverters	Solis	S6-GC25K-US	1
Panelboards	TBD	480 VAC, 800A	1
Panelboards	TBD	480 VAC, 450A	1
Panelboards	TBD	480 VAC, 400A	1
Panelboards	TBD	480 VAC, 300A	2
Panelboards	TBD	480 VAC, 200A	1
Transformers	TBD	500 kVA, 480:120/208 VAC	1
Transformers	TBD	75 kVA, 480:120/208 VAC	1
Transformers	TBD	75 kVA, 480:120/240 VAC, 3-Ph, 4-W	1
Disconnects	TBD	240 VAC, 200 A, Fused	1
Disconnects	TBD	240 VAC, 200 A, Unfused	1
Disconnects	TBD	240 VAC, 2000 A, Fused	1
Disconnects	TBD	600 VAC, 600A, Fused	1
Disconnects	TBD	600 VAC, 400A, Fused	1

Full Portfolio Equipment List (Continued)

Item	Manufacturer	Model # / Size	Quantity
DAS	AlsoEnergy	PLCS400	3
DAS	AlsoEnergy	PLCS600	1
DAS	AlsoEnergy	Custom: (System must include a module temperature sensor, irradiance sensor, and CTs with a 2000:5 CT ratio)	1
EV Chargers	TBD	32A/Level 2	18

Blackberry Farm Equipment List

Blackberry Farm Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	126
Rapid Shutdown / Optimizers	TIGO	TS4-A-O	126
Inverters	Solis	S6-GC60K-US	1
Transformers	TBD	75 kVA, 480:120/240 VAC, 3-Ph, 4-W	1
Disconnects	TBD	240 VAC, 200 A, Fused	1
DAS	AlsoEnergy	PLCS400	1
EV Chargers	TBD	32A/Level 2	2

Community Hall Equipment List

Community Hall Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	85
Rapid Shutdown / Optimizers	TIGO	TS4-A-2F	43
Inverters	Solis	S6-GC50K-US	1
Transformers	TBD	75 kVA, 480:120/208 VAC	1
Disconnects	TBD	240 VAC, 200 A, Unfused	1
DAS	AlsoEnergy	PLCS400	1

Library Equipment List

Library Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	729
Rapid Shutdown / Optimizers	TIGO	TS4-A-2F	90
Inverters	Solis	S5-GC100K-US	1
Inverters	Solis	S5-GC75K-US	2
Inverters	Solis	S6-GC60K-US	2
Inverters	Solis	S6-GC33K-US	1
Panelboards	TBD	480 VAC, 800A	1
Panelboards	TBD	480 VAC, 300A	1
Panelboards	TBD	480 VAC, 200A	1
Transformers	TBD	500 kVA, 480:120/208 VAC	1
Disconnects	TBD	240 VAC, 2000 A, Fused	1
DAS	AlsoEnergy	Custom: (System must include a module temperature sensor, irradiance sensor, and CTs with a 2000:5 CT ratio)	1
EV Chargers	TBD	32A/Level 2	8

Quinlan Community Center Equipment List

Quinlan Community Center Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	537
Rapid Shutdown / Optimizers	TIGO	TS4-A-2F	47
Inverters	Solis	S5-GC100K-US	1
Inverters	Solis	S5-GC90K-US	1
Inverters	Solis	S6-GC50K-US	1
Inverters	Solis	S6-GC33K-US	1
Panelboards	TBD	480 VAC, 450A	1
Panelboards	TBD	480 VAC, 300A	1
Disconnects	TBD	600 VAC, 600A, Fused	1
DAS	AlsoEnergy	PLCS600	1
EV Chargers	TBD	32A/Level 2	4

Sports Center Equipment List

Sports Center Equipment List			
Item	**Manufacturer**	**Model # / Size**	**Quantity**
Modules	Heliene Inc	156HC-580 M10 SL Bifacial	369
Inverters	Solis	S5-GC75K-US	1
Inverters	Solis	S6-GC36K-US	2
Inverters	Solis	S6-GC25K-US	1
Panelboards	TBD	480 VAC, 400A	1
Disconnects	TBD	600 VAC, 400A, Fused	1
DAS	AlsoEnergy	PLCS400	1
EV Chargers	TBD	32A/Level 2	4

Section 3 – Project Specifications and Technology Evaluation

3.1 Technical Specifications

General

- All power generation and transmission equipment must be UL listed for its designed use.
- Construction must comply with current adopted State Building Code, as amended by the City of Cupertino, which encompasses:
    - Most recently adopted California Building Code (CBC)
    - Most recently adopted California Electric Code (CEC)
    - Most recently adopted California Green Building Code
    - Most recently adopted California Energy Code
    - All other relevant local, state, and national codes
- There must be a minimum 1-year warranty for all materials and workmanship.
- All labor utilized on the project must meet prevailing wage and apprenticeship requirements in the Inflation Reduction Act required to receive the full direct pay credit.

Balance of System Equipment

- Each proposed PV system shall include, at a minimum, one **Visible Blade** AC disconnect for safety and maintenance concerns. System must comply with all Utility interconnection requirements.
- Rooftop PV systems must include rapid shutdown, as required by code.
- String combiner boxes (if applicable) must include properly sized fusing, and all metal equipment and components must be bonded and grounded as required by the CEC.
- All system wiring and conduit must comply with applicable local code and CEC stipulations.
- Wall penetrations must be sealed in compliance with CEC and National Fire Protection Association (NFPA) regulations.
- All wiring materials and methods must adhere to industry-standard best practices.
    - The conductors in the circuit between the AC disconnect switch and point of interconnection must be copper (CU).
    - All conductors shall be provided in conduit appropriate for the conditions in which they are to be located, except conductors between PV modules.
    - Wiring insulation types shall be appropriate for the conditions in which they are located.

- Material requirements:
  - **Project must meet domestic content threshold for bonus ITC credit under the Inflation Reduction Act.**
  - Fasteners and hardware throughout the systems shall be stainless steel or material of equivalent corrosion resistance.
  - Racking components and all structural members shall be anodized aluminum, hot-dipped galvanized steel, or material of equivalent corrosion resistance based on appropriate environmental conditions.
  - Unprotected steel not to be used in any components.
  - All structural steel and iron must be 100% domestically produced.
  - Manufactured components must contain 45% (minimum) domestic content across each project location. This domestic content percentage must be 50% (minimum) if the project begins in 2026.
  - Modules utilized in the project must have a minimum of a 10-year material warranty and 25-year power output guarantee.
  - Power output guarantee must include a maximum of 2% first-year degradation and 0.5% annual degradation.
  - Modules utilized in the project must be from a tier 1 module manufacturer.
  - Inverters utilized in the project mush have a minimum of a 10-year warranty.

<u>Interconnection</u>

- System interconnection must comply with CEC and Utility regulations and must be approved by the local Utility and the Authority Having Jurisdictions (AHJs).
- Interconnection points will be at facility main switchgear locations, per Single Line Diagrams
- Emergency back-up generation may exist on-site and must be factored into proposed PV system electrical plans.
- All placards required by the AHJ, the Utility, and/or State Solar Initiative program must be provided and installed according to SES and CEC guidelines.

<u>Monitoring and Reporting Systems</u>

- Monitoring shall include revenue-grade metering of PV system production, a pyranometer, and a module temperature sensor.
- Monitoring system shall include an online portal with a graphical user interface for the city to be able to remotely access site production and weather data.

- Respondent will be responsible for providing all required monitoring communications and power wiring and conduit.

System Design and Permitting

- Construction plan set shall include (at a minimum):
    - Site overview
    - Detailed array layout with stringing configuration
    - Mounting and racking details
    - Details of electrical transmission showing conduit routing and location of electrical enclosures, conduit support details, and enclosure mounting details
    - Electrical single-line diagram
    - Electrical three-line diagram
    - Monitoring plan
- All proposed system designs and construction techniques must be approved by the AHJ
- Wire loss in DC circuits to be < 1.5%.
- Wire loss in AC circuits to be < 3%.
- Minimum 30-year design life for structural members.
- Carports must have a minimum height of 10′.
- Where carport footprints encroach onto existing fire lanes, a minimum structure height of 13′-6″ must be maintained.

EV Charging Requirements

- Carport projects located in parking lots must have EV chargers and EV-ready spaces installed in accordance with CALGreen Requirements, as amended by the Cupertino Municipal Code.
- EV charging stations must be fed by a dedicated subpanel, with individual dedicated breakers for each charger.

Construction

- All electrical enclosures and equipment shall be installed to be readily accessible to qualified personnel only.
- All visible conduits and electrical equipment shall be painted or aesthetically dressed to match existing structures.
- Location of existing underground utilities must be marked by USA/Dig Alert or equivalent private service prior to any underground work. Contractor to utilize Ground Penetrating Radar to locate any private utilities prior to drilling, boring, or trenching.

Commissioning

- Systems shall be commissioned in accordance with industry best practices, and include (at a minimum):

- Insulation resistance testing
- I-V Curve testing
- 7-day performance (capacity) testing

- Commissioning shall be completed at the conclusion of the construction phase of the project.
- A commissioning report shall be prepared (encompassing all testing performed, including the above required testing at minimum.) For review and acceptance by the city before final completion of the project.

3.2 New Technology Evaluation

New technology options were evaluated as a part of this project, though no emerging technologies were selected to be leveraged. One such technology that was investigated was building integrated, transparent coatings for windows which generate solar energy; unfortunately, the sites which have been selected for this project are not particularly well suited to this technology, as there are a limited number of windows at these locations with ideal orientations and good solar access. Additionally, as this is an emerging technology in the marketplace, there are risks inherent in being an early adopter. For a solar PV project, which has an expected lifespan of 30 years, utilizing proven, bankable technologies to ensure that long term value is captured from the systems in a predictable fashion is critical to ensure the ongoing viability of the investment.

Each site was evaluated as a fit for this technology, though none were selected for the reasons specified below:

Blackberry Farm:

-No large glass building facades

-Suboptimal facing of windows in existing structures for solar production

-Large number of separate structures would require significant underground work to connect the system in a single location

-Significant shade cast on buildings prevents optimal energy production

Community Hall:

-No large glass building facades

-Significant shading from Library building would reduce solar production

Library:

-No large glass building facades

-Significant shading from nearby trees would significantly impact energy production

-Not enough available real estate on building facades to meet production needs

Quinlan Community Center:

-Significant shading from nearby trees would significantly impact energy production

-Not enough available real estate on building facades to meet production needs

Sports Center:

-No large glass building facades

-Significant shading from nearby trees would significantly impact energy production

-Not enough available real estate on building facades to meet production needs

Thin-film solar modules were an alternative technology that was also considered for the project. The benefits associated with these modules are that they are lower cost and lighter weight. While they do provide excellent benefits, this module type tends to be less efficient and less durable than traditional solar modules. With lower efficiency than traditional modules, more space is required to provide the same electrical output when utilizing the thin-film module option. Due to the desire to maintain as many trees as possible in the project, the additional real estate necessary to utilize this type of module on the project would have likely come at the expense of additional trees needing to be removed. Furthermore, maximizing the system's durability is a priority on the project to ensure that the system encounters as few issues as possible during its projected 30-year life cycle.

3.3 Energy Storage Evaluation

All five project locations were evaluated to determine the feasibility and efficacy of installing a battery to provide site resilience and financial benefits for the city. Batteries can typically provide revenue in two main ways. The first is by capturing low-cost energy at off-peak times and utilizing this energy to offset higher-cost electrical usage during peak times (energy arbitrage.) The second is by discharging energy during high-usage time periods on site to offset electrical demand charges (demand reduction.)

Under NEM2, the ability to generate cost savings through energy arbitrage is limited, as there is little cost differential between on-peak and off-peak energy. Under NEM3, a battery can capture excess energy which would be exported to the utility grid for minimal value, and instead consume this energy on site during high-cost periods. As the average differential between NEM3 exported energy and retail energy prices is significantly larger than the difference in retail price between time periods, there is a vastly expanded opportunity for the energy storage system to provide cost savings when compared with NEM2 through energy arbitrage. As the systems approach the end of the 20-year NEM2 lock-in period, it is recommended that the addition of a battery to these projects should be reevaluated.

Energy storage systems can also be utilized to mitigate electrical demand charges at a project location. Demand charges are levied based on the maximum amount of electrical energy used within any 15-minute period throughout the billing cycle (typically a month.) The batteries can discharge energy during these high-usage intervals, reducing the energy consumed in these windows to reduce the associated demand charge. This benefit tends to complement solar PV systems, as the ability to target these high usage periods is much greater with a controllable resource as opposed to one dependent on available sunlight and weather conditions.

PV systems under NEM2 are particularly effective at offsetting energy charges, as excess energy produced during any time period is credited to the customer at close to the retail rate of electricity, with the difference in credited and retail value being equal to the non-bypassable charges associated with consumed energy. This credited value can be used to offset the electrical energy charges accrued during times of the day where the system is not producing energy (i.e. at night.) A solar PV system is much less effective in offsetting demand charges when compared with energy charges. Because demand charges are based on the highest-usage 15-minute interval within a billing period, which does not always occur in-line with solar production, the system will not necessarily offset these charges. Even if the peak site usage coincides with solar production, a new, lower peak will be recorded. The only ways to completely mitigate demand charges are to not import any energy from the utility, or to reduce the demand to a level at which the site becomes eligible for a utility rate schedule which does not include demand charges.

As the solar PV system in each location will be on NEM2, the additional financial benefit of a battery is limited; however, there are two project locations (Quinlan Community Center and Sports Center,) where a battery can be utilized to mitigate the site's electrical demand to the point at which these sites will become eligible for the B1 and B6 rate schedules, which do not include demand charges. For these rate schedules, the marginal electrical costs are rolled into the energy portion of the bill which can be directly offset by the PV system, allowing for much greater avoided costs from the system compared with a standalone PV project on a rate schedule which includes demand charges.

For the remaining sites, the project locations are either already on or are eligible for energy-only rate schedules (Blackberry Farm and Civic Center,) or have a level of electrical demand that can't be mitigated to the point where the location is eligible for an energy-only rate schedule (Library.) The current estimated benefit of cost avoidance utilizing batteries at these three locations is not sufficient to offset the estimated costs of installing, maintaining, and operating these energy storage systems, and therefore is not recommended at these locations.

The sites were also evaluated to determine how much energy storage would be needed to support backup power for each location for a period of 1 and 2 days (in concert with the planned PV system at each site.) The estimated battery size required for each of these outcomes is shown in the table below:

City of Cupertino Battery Evaluation Summary			
Project Location	**Rate Change***	**1 Day Backup**	**2 Days Backup**
Blackberry Farm	N/A	200 kWh	350 kWh
Civic Center	N/A	300 kWh	575 kWh
Library	N/A	2,000 kWh	3,850 kWh
Sports Center	225 kWh	650 kWh	1,150 kWh
Quinlan Community Center	200 kWh	500 kWh	800 kWh

*The addition of EV chargers for each of these projects may impact each site's electrical demand. The power available for use at each charger will need to be managed by a load-management system (in concert with the energy storage system) to ensure car charging doesn't adversely impact the ability of the battery to provide the demand reduction necessary to facilitate a rate change.

This is a high-level evaluation of what would be needed to support full site backup for the listed durations; there is also flexibility to design a microgrid system to support only critical electrical loads, which would have a significant impact on the backup duration that could be provided from a battery of a similar size. In order to design an ideal microgrid for each location, a detailed review of project goals and requirements would need to be undertaken.

Of note, in order to accommodate full-facility backup operation of each of these project locations, significant infrastructure upgrades will be necessary – while there are multiple options available to facilitate this full-facility backup, significant reconfigurations and/or upgrades to the electrical capacity of the sites' switchgears would be necessary. These infrastructure upgrades can likely be mitigated if a smaller scale, critical-load backup was desired in place of full-facility backup.

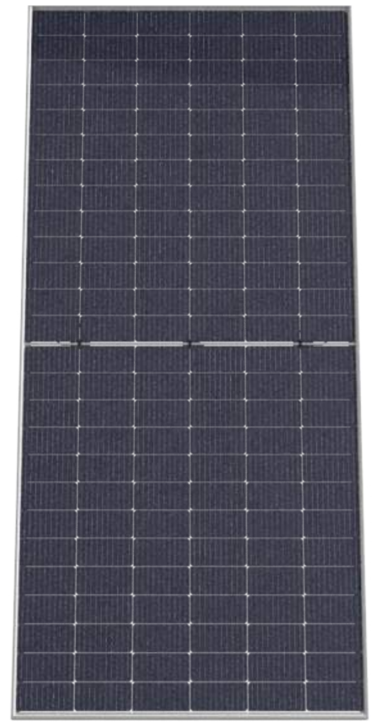
Infrastructure upgrades at the Sports Center and Quinlan Community Center would not be required to utilize the needed size of energy storage system to provide the electrical demand reduction necessary for a change in rate schedule. Upgrades would not be necessary at these locations for demand reduction functionality, as the systems would not need to function during a power outage. As a result, the resources could be connected on the utility's side of the main breaker, allowing the systems to avoid size restrictions in the CEC associated with connections on the customer's side of the main breaker. Please note that this analysis is based on the customer's infrastructure – upgrades to utility infrastructure (transformer, service conductors, etc.) may still be required for these options.

Appendix A – Equipment Cut Sheets

HELIENE

156HC M10 SL Bifacial Module

156 Half-Cut Monocrystalline 565W – 585W



21%

Utilizes the latest M10 size super high efficiency Monocrystalline PERC cells. Half cut design further reduces cell to module (CTM) losses.

Hail Resistance

Framed Glass-backsheet construction is ideal for Hail resistance upto 55mm.

Anti-Reflective

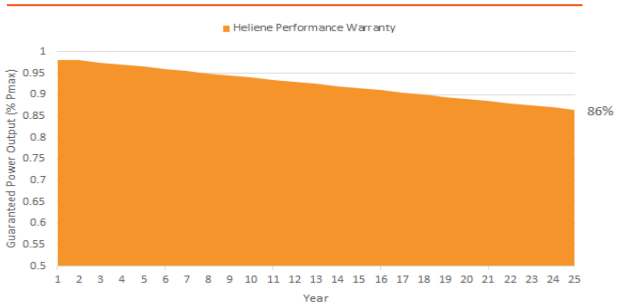
Premium solar glass with anti reflective coating delivers more energy throughout the day

High Reliability

Proven resistance to PID and reliable in high temperature and humidity environments.

No Compromise Guarantee

15 Year Product Warranty
25 Year Linear Performance Guarantee



c ETL US LISTED Intertek

TOP PERFORMER 2024 kiwa PVEL PV MODULE RELIABILITY SCORECARD

Manufactured Using International Quality System Standards: ISO9001

Half-Cut Design with Split Junction Box Technology

Bifacial Technology Enabling Additional Energy Harvest from Rear Side

2% First Year Degradation & 0.5% Annual Power Degradation

World-class Quality

- Heliene's fully automated manufacturing facilities with state-of-the-art robotics and computer aided inspection systems ensure the highest level of product quality and consistency
- All manufacturing locations are compliant with international quality standards and are ISO 9001 certified
- Heliene modules have received Top Performer rankings in several categories from PV Evolution Labs (PV EL) independent quality evaluations

Bankable Reputation

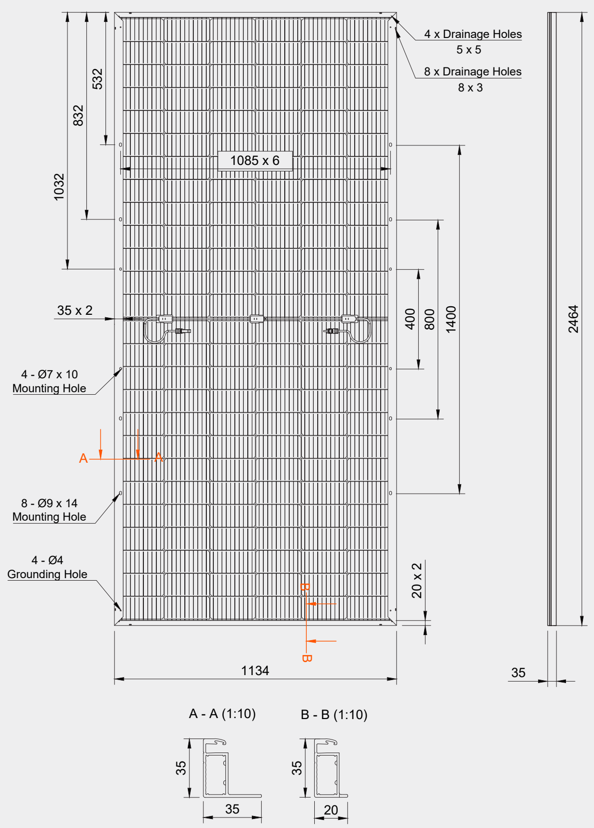
- Established in 2010, Heliene is recognized as highly bankable Tier 1 manufacturer of solar modules and has been approved for use by the U.S. Department of Defense, U.S. Army Corps of Engineers and from numerous top tier utility scale project debt providers
- By investing heavily in research and development, Heliene has been able to stay on the cutting edge of advances in module technology and manufacturing efficiency

Local Sales, Service, and Support

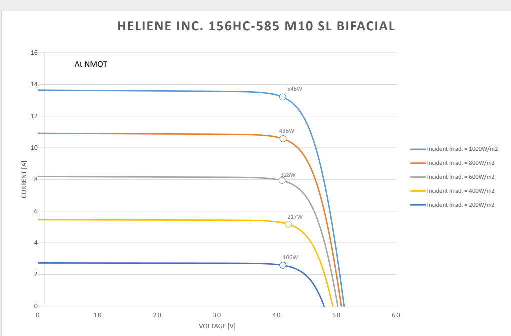
- With sales offices across the U.S. and Canada, Heliene prides itself on unsurpassed customer support for our clients. Heliene has become the brand of choice for many of the leading residential installers, developers and Independent Power Producers due to our innovative technology, product customization capability and just in time last-mile logistics support
- Local sales and customer support means answered phone calls and immediate answers to your technical and logistics questions. We understand your project schedules often change with little warning and endeavor to work with you to solve your project management challenges

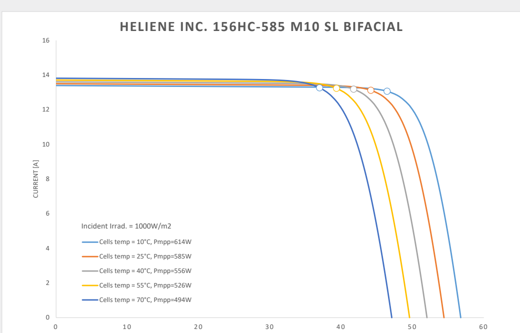
156HC M10 SL Bifacial Module

Dimensions for 156HC M10 SL Bifacial Series Modules



I-V Curves for 156HC M10 SL Bifacial Series Modules





Electrical Data (STC)

Peak Rated Power*	P_{mpp} (W)	585	580	575	570	565
Maximum Power Voltage	V_{mpp} (V)	45.85	45.64	45.44	45.23	45.02
Maximum Power Current	I_{mpp} (A)	12.77	12.70	12.64	12.58	12.52
Open Circuit Voltage*	V_{oc} (V)	54.41	54.13	53.86	53.59	53.32
Short Circuit Current**	I_{sc} (A)	13.50	13.48	13.46	13.44	13.42
Module Efficiency	Eff (%)	20.9	20.8	20.6	20.4	20.2
Maximum Series Fuse Rating	MF (A)	30	30	30	30	30
Power Sorting Range		[- 0/+3%]				
Bifaciality Factor***		70 ± 5%				

STC - Standard Test Conditions: Irradiation 1000 W/m² - Air mass AM 1.5 - Cell temperature 25 °C,
*P_{mpp} Production Tolerance ± 3%, *V_{oc} Production Tolerance ± 3%, **I_{sc} Production Tolerance ± 4%
***Bifaciality Factor= $Pmpp_{rear}/Pmpp_{front}$ where $Pmpp_{rear}$ and $Pmpp_{front}$ are tested at STC

Electrical Data (NMOT)

Maximum Power	P_{mpp} (W)	436	432	429	425	421
Maximum Power Voltage	V_{mpp} (V)	43.56	43.36	43.17	42.97	42.77
Maximum Power Current	I_{mpp} (A)	10.01	9.97	9.93	9.89	9.85
Open Circuit Voltage	V_{oc} (V)	51.68	51.43	51.17	50.91	50.66
Short Circuit Current	I_{sc} (A)	10.91	10.89	10.88	10.86	10.84

NMOT - Nominal Module Operating Temperature:
Irradiance at 800W/m², Ambient Temperature 20°C, Wind speed 1m/s

Mechanical Data

Solar Cells	156 Half Cut, M10, 182mm, PERC Cells
Module Construction	Framed Glass–Backsheet
Dimensions (L x W x D)	2464 x 1134 x 35 mm (97.01 x 44.65 x 1.38 inch)
Weight	31 kg (68.34 lbs)
Frame	Double Webbed 15-Micron Anodized Aluminum Alloy
Glass	3.2mm Low-Iron Content, High-Transmission, PV Solar Glass with Anti Reflective Coating
Junction Box	IP-68 rated with 3 bypass diodes
Output Cables	4mm² (12AWG), 0.3-meter Symmetrical Cables Optional: 1.2-meter Symmetrical Cables upon request
Connectors	Multi-Contact/ Stäubli MC4

Certifications

UL Certification	UL61215, UL61730

Temperature Ratings

Nominal Module Operating Temperature (NMOT)	+45°C (±2°C)
Temperature Coefficient of P_{max}	-0.34%/°C
Temperature Coefficient of V_{oc}	-0.25%/°C
Temperature Coefficient of I_{sc}	0.05%/°C

Maximum Ratings

Operational Temperature	-40°C to +85°C
Max System Voltage	1500V
Mech. Load Test (Front)	113 psf / 5400 Pa
Mech. Load Test (Back)	50 psf / 2400 Pa
Fire Type	Type 1

Warranty

15 Year Product Warranty

25 Year Linear Power Guarantee

Packaging Configuration

Modules per Pallet 40' Container:	31 pieces
Modules per 40' Container:	620 pieces
Modules per Pallet 53' Trailer:	28 pieces
Modules per 53' trailer:	588 pieces

solis
ussales@solisinverters.com

S5-GC(75-100)K-US

Solis Three Phase Grid-Tied Inverters

Efficient

- 8/9/10 MPPTs, max. efficiency 98.8% (CEC efficiency 98.3%)
- > 1.5 DC/AC ratio
- String current up to 16A for higher capacity modules

Safe

- Type 4X, C5 Anti-Corrosion Level
- UL 1741 SA and SB
- External signal control function
- Integrated nighttime PID recovery for optimal module performance
- AFCI protection, proactively reduces fire risk
- High quality components from globally recognized suppliers

Economic

- DC side supports "Y" connector

Smart

- Intelligent string monitoring, smart I-V curve scan
- Remote firmware upgrade with simple operation[1]

Models:

S5-GC75K-US / S5-GC80K-US

S5-GC90K-US / S5-GC100K-US

Ordering: S5-GC(75-100)K-US

- APST (APS MLRSD Transmitter)
- RSS (Tigo MLRSD Transmitter)
- NEPT (NEP MLRSD Transmitter)

360° View

(1) Requires the user to use Solis monitoring

DATASHEET S5-GC(75-100)K-US

Models	75K	80K	90K	100K
Input DC				
Max. input voltage	1000 V			
Rated voltage	600 V			
Start-up voltage	195 V			
MPPT voltage range	180-1000 V			
Max. input current	8*32 A	9*32 A	10*32 A	
Max. short circuit current	8*50 A	9*50 A	10*50 A	
MPPT number/Max. input strings number	8/16	9/18	10/20	
Output AC				
Rated output power	75 kW	80 kW	90 kW	100 kW
Max. apparent output power	75 kVA	80 kVA	90 kVA	100 kVA
Max. output power	75 kW	80 kW	90 kW	100 kW
Rated grid voltage	3Φ/PE, 480 V			
Rated grid frequency	60 Hz			
Max. output current	90.2 A	96.2 A	108.3 A	120.3 A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)			
THDi	<3%			
Efficiency				
Max. efficiency	98.7%		98.8%	
CEC efficiency	98.3%		98.2%	
Protection				
DC reverse-polarity protection	Yes			
Surge protection	DC Type II / AC Type II			
Ground fault monitoring	Yes			
Anti-islanding protection	Yes			
Strings monitoring	Yes			
I/V Curve scanning	Yes			
Rapid shutdown	Yes			
Integrated AFCI (DC arc-fault circuit protection)	Yes			
Integrated PID recovery	Yes			
AC switch	Yes			
General Data				
Dimensions (W*H*D)	41.9*22.3*13.6 in (1065*567*344.5 mm)			
Weight	187 lbs (85 kgs)			
Topology	Transformerless			
Self-consumption (night)	<2 W			
Relative humidity	0-100%			
Operating ambient temperature range	-22°F to 140°F (-30°C to +60°C)			
Storage environment	-40°F to 176°F (-40°C to 80°C)			
Ingress protection	TYPE 4X			
Cooling concept	Intelligent redundant fan-cooling			
Max. operation altitude	13,120 ft (4000 m)			
Compliance	UL1741SB, UL1741SA, IEEE 1547-2018, UL1699B, UL1998, FCC Part15 ClassB, California Rule 21, Heco Rule 14H, NEC 690.12-2020, CAN/CSA C22.2107.1-1			
Features				
DC connection	MC4 connector			
AC connection	OT Terminal (max. 350 MCM)			
Display	LCD			
Communication	RS485, Ethernet, Optional: Wi-Fi, Cellular			

Ordering guidelines: Determine the basic model and add your desired features from above.
Ex: S5-GC75K-US-APST (Inverter with APS transmitter)

solis
ussales@solisinverters.com

S6-GC(25-60)K-US

Solis Three Phase Grid-Tied Inverters

Efficient

- Max. efficiency 98.8% (CEC efficiency 98.5%)
- String current up to 20A
- 3/4 MPPT design, supports multiple orientation system design
- Night time PID recovery function, increases overall system yield (optional)
- Wide voltage range and low startup voltage

Safe

- Type 4X, C5 Anti-Corrosion Level
- AFCI protection, proactively reduces fire risk
- Intelligent redundant fan-cooling
- Integrated module level rapid shutdown transmitter
- High quality components from globally recognized suppliers
- Integrated DC and AC disconnects

Smart

- Equipped with external power control interface, supporting zero output power control
- Intelligent string monitoring, smart I-V curve scan
- Supports RS485, Ethernet, WiFi, Cellular
- Scan to register on SolisCloud, supports remote upgrade and control

Economic

- > 1.5 DC/AC ratio
- Supports high power modules for lower installation costs
- Separable AC wiring box

Models:

S6-GC25K-US / S6-GC33K-US

S6-GC36K-US / S6-GC40K-US

S6-GC50K-US / S6-GC60K-US

Ordering: S6-GC(25-60)K-US

- APST (APS MLRSD Transmitter)
- RSS (Tigo MLRSD Transmitter)
- NEPT (NEP MLRSD Transmitter)

solis

www.solisinverters.com

DATASHEET

S6-GC(25-60)K-US

Models	25K	33K	36K	40K	50K	60K
Input DC						
Max. input voltage	1000 V					
Rated voltage	720 V					
Start-up voltage	180 V					
MPPT voltage range	180-1000 V					
Max. input current	3*40 A				4*40 A	
Max. short circuit current	3*63 A				4*63 A	
MPPT number/Max. input strings number	3/6				4/8	
Output AC						
Rated output power	25 kW	33 kW	36 kW	40 kW	50 kW	60 kW
Max. apparent output power	27.5 kVA	36.3 kVA	39.6 kVA	44 kVA	55 kVA	66 kVA
Max. output power	27.5 kW	36.3 kW	39.6 kW	44 kW	55 kW	66 kW
Rated grid voltage	3Φ/PE, 480 V					
Rated grid frequency	60 Hz					
Max. output current	33.1 A	43.7 A	47.6 A	52.9 A	66.2 A	79.4 A
Power factor	>0.99 (0.8 leading - 0.8 lagging)					
THDi	<3%					
Efficiency						
Max. efficiency	98.8%					
CEC efficiency	98.5%					
Protection						
DC reverse-polarity protection	Yes					
Short circuit protection	Yes					
Output over current protection	Yes					
Surge protection	DC Type II / AC Type II					
Grid monitoring	Yes					
Anti-islanding protection	Yes					
Temperature protection	Yes					
Strings monitoring	Yes					
I/V Curve scanning	Yes					
Integrated AFCI (DC arc-fault circuit protection)	Yes					
Integrated PID recovery	Optional					
Integrated DC switch	Yes					
Integrated AC switch	Yes					
General Data						
Dimensions (W*H*D)	30.9*21.6*12.6 in (784*549*320 mm)					
Weight	96.3 lbs (43.7 kgs)		105.4 lbs (47.8 kgs)		108.7 lbs (49.3 kgs)	110.5 lbs (50.1 kgs)
Topology	Transformerless					
Self-consumption (night)	<1 W					
Relative humidity	0-100%					
Operating ambient temperature range	-13°F to 140°F (-25°C to 60°C)					
Ingress protection	TYPE 4X					
Cooling concept	Natural convection					
Max. operation altitude	13,120 ft (4000 m)					
Compliance	UL1741SB, UL1741SA, IEEE 1547-2018, UL1699B, UL1998, FCC Part15 ClassB, California Rule 21, Heco Rule 14H, NEC 690.12-2020, CAN/CSA C22.2107.1-1					
Features						
DC connection	MC4 connector					
AC connection	OT terminal (4 AWG to 3/0 AWG)					
Display	LCD					
Communication	Modbus RTU (Sunspec compliant), RS485, Optional: Cellular, Wi-Fi					

DATA SHEET

AlsoEnergy

PLCS 600: PowerLogger Commercial Solution 600

AlsoEnergy's vertically-integrated, edge-to-cloud platform includes a convenient standardized hardware monitoring solution for small to mid-sized commercial PV systems. The PLCS 600 combines our standard commercial datalogger with a revenue grade meter, a weatherproof NEMA 4 enclosure, and other supporting hardware. Customers may choose to add weather sensors and/or a cellular modem. The PLCS 600 is recommended for 3-phase systems with up to 20 external inverters. Performance data is uploaded to PowerTrack, AlsoEnergy's flagship cloud-based application for monitoring, managing, and optimizing energy and financial performance of clean energy assets.

Standardized PLCS 600 includes:

- DataLogger with LCD touchscreen display
- Revenue grade energy meter compatible with all 5A CTs (sold separately)
- Two optional weather station choices may add data for irradiance, back-of-module panel temperature, ambient temperature, and wind speed
- 5-port Ethernet switch
- NEMA4 weatherproof enclosure
- Optional 4G cell modem (requires a cellular plan)

Solution Features

- Up to 20 external inverters
- Modbus via RS-485 or TCP connections to inverters
- Cellular or Ethernet connectivity
- Remote firmware updates
- Up to 1-minute data granularity
- Uploads at 5-minute intervals
- Suitable for demand meter, relay, other non-PV use cases
- For systems with a single metering point; direct metering or PT secondary voltage up to 600VAC
- Satisfies reporting requirements for most US electricity sector agencies
- All parts except weather sensors and cell modem covered with standard AlsoEnergy 5-year warranty
- Supported on PowerTrack only engineering & project management teams

PLCS-600-CM-PLUS	+ cell modem, + reference cell, BOM panel temperature, ambient temperature, wind speed
PLCS-600-CM-BASE	+ cell modem, + reference cell, BOM panel temperature
PLCS-600-CM-00	+ cell modem, no environmental sensors
PLCS-600-00-PLUS	no cell modem, + reference cell, BOM panel temperature, ambient temperature, wind speed
PLCS-600-00-BASE	no cell modem, + reference cell, BOM panel temperature
PLCS-600-00-00	no cell modem, no environmental sensors

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Specifications: PLCS-600

ASSEMBLY	
Enclosure dimensions	15.7" x 15.7" x 7.9" (400mm x 400mm x 200mm)
Enclosure rating	NEMA4
Operating temperature	-13° to 158°F (-25° to 70°C), <95% relative humidity non-condensing
Power supply	120-277VAC
Communication ports	Three available 10/100 Ethernet ports, two half-duplex rs485 ports
Regulatory	UL listed 508A

DATALOGGER	
Devices supported	Up to 40 connected Modbus RTU enabled devices (20 per rs485 port) / *Recommended limit 32*
Storage	Removable 2GB industrial rated micro SD card
Serial	RS-485 with integrated 120 ohm termination resistor
Primary protocols	Modbus TCP, Modbus RTU, most proprietary inverter protocols
Touch screen	Color, resistive touch screen 2" by 2.75"
Warranty	Standard 5-year warranty

METER	
Voltage inputs	90-600VAC
Accuracy	Meter 0.2% (see CT datasheet for CT accuracy information)
CTs	Any CT with 5A secondary current ratio (sold separately)
CT accuracy	Refer to CT datasheet
Warranty	Standard 5-year warranty

IRRADIANCE SENSOR (included with Base and Plus weather station option)	
Irradiance sensor type	Monocrystalline Silicon reference cell with mounting bracket and 3m twisted pair shielded cable
Absolute accuracy	±5W/m2 ± 2.5% of reading
Dimensions	3.34” W x 6.10” H x 1.54” D (85mm x 155mm x 39mm)
Warranty	1 year against defects in materials and workmanship

BACK OF MODULE PANEL TEMPERATURE SENSOR (included with Base and Plus weather station option)	
Form	3m cable with 3-pin connector compatible with paired reference cell - sensor cable cannot be extended
Sensor type	PT1000 Class A
Mounting	Self-adhesive for attaching to a solar module
Warranty	1 year against defects in materials and workmanship

WIND SPEED SENSOR (included with Plus weather station option)	
Form	Cup star anemometer with 5m 2-pin connector compatible with paired reference cell
Sensor type	Reed relay
Mounting	Mounting bracket for pole or surface mounting included
Accuracy	0.5 m/s or 5% of reading
Sensor range	0.9 – 40m/s (2 – 90 mph)
Warranty	1 year against defects in materials and workmanship

AMBIENT TEMPERATURE SENSOR (included with Plus weather station option)	
Voltage inputs	90-600VAC
Accuracy	Meter 0.2% (see CT datasheet for CT accuracy information)
CTs	Any CT with 5A secondary current ratio (sold separately)
Warranty	Standard 5-year warranty

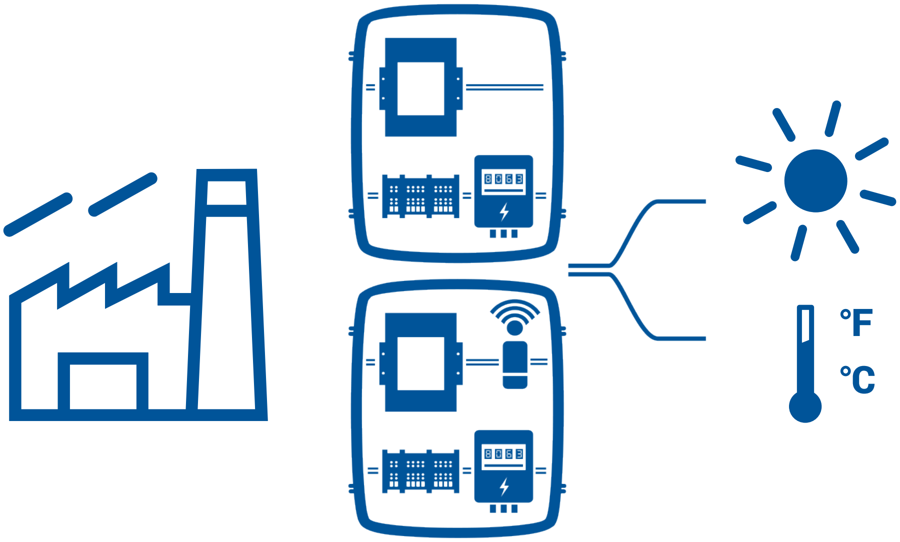
IRRADIANCE SENSOR (included with Base and Plus weather station option)	
Form	Pt1000 1/3 Class B with integrated modbus RTU digitizer
Dimensions	3.34" W x 6.10" H x 1.54" D (85mm x 155mm x 39mm)
Wiring	Includes 3 meters of twisted-pair, shielded cable
Warranty	1 year against defects in materials and workmanship

CELL MODEM	
Cellular data	4G LTE
Warranty	1 year

DATA SHEET

PLCS 400: Power Light Commercial Solution 400

AlsoEnergy's vertically-integrated, edge-to-cloud platform includes a cost-effective standardized hardware monitoring solution for light commercial PV systems. The PLCS 400 is designed for 3-phase systems with up to 16 external inverters. Performance data is uploaded to the PowerTrack or LocusNOC applications, which provide a suite of tools and analytics for asset managers. A successor for the Locus LGate 320, the PLCS 400 provides direct monitoring of inverters across all supported inverter technologies.



Standardized PLCS 400 system includes:

- DataLogger with LCD touchscreen display
- Energy meter with 3 solid core CTs (revenue grade accuracy)
- Weather station with irradiance sensor, mounting bracket, and module temperature sensor
- 5 port Ethernet switch
- NEMA4 weatherproof enclosure
- Optional 4G cell modem (requires a cellular plan)

Solution Features

- Up to 16 external inverters
- Modbus via RS-485 or TCP connections to inverters
- Cellular or Ethernet connectivity
- Remote firmware updates
- 5-minute data granularity
- Uploads at 2 hour intervals
- Satisfies most US agency reporting requirements
- For systems up to 325kW utilizing 480V inverters (140kW @ 208V)
- All parts covered with standard AlsoEnergy 5-year warranty (excluding irradiance sensor and cell modem)

Product Qualifications

- PLCS 400 logs data during daylight hours only; for demand metering applications the PL1000 is recommended
- PLCS 400 has a fixed range of supported inverter models for clients using LocusNOC software. The full list of supported inverters is https://kb.alsoenergy.com/article.php?id=1418

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Specifications: PLCS-400 / PLCS-400-CM

ASSEMBLY	
Enclosure dimensions	15.7" x 15.7" x 7.9" (400mm x 400mm x 200mm)
Enclosure rating	NEMA4
Operating temperature	-13° to 158°F (-25° to 70°C), <95% relative humidity non-condensing
Power supply	120-277VAC
Ports	Three available 10/100 Ethernet ports

DATALOGGER	
Devices supported	Up to 16 inverters – only inverters supported as external devices
Storage	Removable 2GB industrial rated micro SD card
Serial	RS-485 with integrated 120 ohm termination resistor
Primary protocols	Modbus TCP, Modbus RTU, most proprietary inverter protocols
Touch screen	Color, resistive touch screen 2" by 2.75"
Warranty	Standard 5 year warranty

METER	
Voltage inputs	90-600VAC
Accuracy	Class 0.5S
CTs	3 solid core CTs with 1.25 inch opening; rated input up to 400 Amp
CT accuracy	±0.5% revenue grade accuracy
Regulatory	UL listed 508A
Warranty	Standard 5 year warranty

CELL MODEM	
Cellular data	LTE Cat M1
Warranty	1 year

IRRADIANCE SENSOR	
Pyranometer type	Silicon cell with mounting bracket
Absolute accuracy	±5%
Dimensions	1.12" H x 0.93" D (28.32mm x 23.5mm)
Wiring	Includes 5 meters of twisted-pair, shielded wire with Santoprene jacket
Operating temperature	-13° to 131°F (-25° to 55°C)
Warranty	1 year against defects in materials and workmanship

PANEL TEMPERATURE SENSOR	
Form	Thermal tab disk with 10 ft lead to an outdoor enclosure with a 4-20mA transmitter
Sensor type	Platinum RTD 1K
Mounting	Self-adhesive ring for attaching to a solar module
Operating temperature	-40 to 185°F (-40 to 85°C)
Transmitter range	Transmitter can be extended 1000 ft from enclosure with 18AWG cable
Warranty	Standard 5 year warranty

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