EXHIBIT A

July 27, 2023

Deschutes County Fairgrounds PV Feasibility Study

3800 SW Airport Way, Redmond, OR 97756

Contents

Appendix A – Site Plan

Appendix B – Single-Line Diagram

Appendix C – Helioscope Report

Appendix D – PV & Inverter Datasheets

Appendix E – Xendee Report

Appendix F – RFP System Description & Needs

Glossary and Acronyms

Alternating Current (AC)
A type of electrical current that is usable in buildings and for appliances.
Annual Solar Energy Offset (%)
Solar energy savings as a percentage of annual energy cost.
Automatic Transfer Switch (ATS)
Used for generators to automatically switch the load from utility to the generator
Azimuth Angle
The angle between true south and the point on the horizon directly below the sun.
Battery Energy Storage System (BESS)
Technology and equipment used to store electricity for use at a later time.
Direct Current (DC)
Electrical transmission and distribution that must be converted to Alternating Current for use in a building.
Distributed Energy Resources (DER)
Small-scale energy resources usually situated near sites for electrical use.
Green Energy Technology (GET)
Referring to the Oregon legal requirement for public entities to allocate 1.5% of the budget of large construction projects to renewable energy.
Gigawatt Hour (GWh)
One billion watt hours, a unit of measurement of a quantity of energy.
Net Metering
A solar incentive that allows utility customers to generate surplus solar energy that is sent back onto the grid for a billing credit at the retail utility rate.
Overcurrent Protection Device (OCPD)
Operation and Maintenance standards for a specified system
Operation and Maintenance (O&M)
Operation and Maintenance standards for a specified system
Photovoltaic (PV) Array
A renewable energy system that connect multiple solar PV modules and inverters to generate electricity.
Point of Interconnection (POI)
The location where a solar PV array connects to the utility grid.

Executive Summary

The Deschutes County Fairgrounds, owned and operated by Deschutes County, is a campus complex located at 3800 SW Airport Way, Redmond, OR 97756. The fairgrounds is a key cultural center in central Oregon, and a large capacity special events venue. Due to the 1.5% GET requirement, the County is presently compelled to make an investment in renewable energy on the order of $600,000.00.

The County has engaged Mayfield Renewables to complete a solar feasibility study of the arena, auditorium, and conference center facilities on the fairgrounds campus. The aim of this study is to generate a concept rooftop PV system design that meets the GET requirements while maximizing financial return over its lifetime. Our analysis includes an evaluation of the site to identify construction and electrical interconnection hurdles. This report provides substantial information that can be used for bid documents, bid specifications, and is the foundation for engineered drawings, construction, commissioning and performance validation. If goals, loads, tariff rates, equipment or construction logistics change over time, edits can easily be made to the concept design to adjust for a smooth successful implementation.

The following goals and benchmarks were used during the system modeling:

- Create and analyze a base model of electrical energy consumption and PV generation with the greatest possible financial return
- Analyze past utility records to generate synthetic load profiles and verify utility rate structure
- Develop a concept system design with a guaranteed maximum price of $600,000, including schematic drawings (Site Plan, Single-Line Diagram) and data sheets for major components
- Provide final report as deliverable
- Project lifespan is 25 years, typical of PV
- Provide written system description for RFP
- Analyze feasibility of battery storage, either now or in the future

Based on our analysis, Mayfield presents a 191.5 kWDC rooftop PV system on the conference center facility that will offset 70% of annual electrical load at that meter. This concept design utilizes reliable and widely available equipment with multiple equivalent market alternatives, and represents an elegant design that maximizes return on investment compared to other options examined. If desired, the conference center and auditorium are capable of supporting additional PV capacity, beyond our concept design. The arena, while electrically capable of supporting additional PV capacity, is not recommended. Our modeling suggests suboptimal financial return for installation on this larger facility, due to a less favorable utility rate structure that cannot be modified.

Site Information & Limitations

2.1 Site Description & Existing Electrical System

The Deschutes County Fairgrounds is located at 3800 SW Airport Way, Redmond, OR 97756. There are nineteen Pacific Power electrical services on the premises, including three under consideration for this study:

Table 1: Electrical Service Summary

Site Name	Meter Number	Rate Schedule	Service Type	Service Size (A)	Xfmr Size (kVA)	*Annual GWh demand
Indoor Arena	85868373	30-135	480Y/277	3,000	1,000	0.671
Conference Center (Middle & South Sister)	85868371	28	208Y/120	3,000	750	0.414
Auditorium (North Sister)	75456300	28	208Y/120	2,000	300	0.299

** Estimated from Pacific Power utility bills, May 22 - Jan 23, and Mar 23 - May 23*

Figure 1. Deschutes County Fairgrounds, annotated site map

Roof area suitable for additional PV is plentiful, totaling roughly 50,000 sq ft. All three buildings under consideration have 2/12 pitch standing seam metal roof areas oriented at 135° azimuth, and the auditorium has a similar section of roofing with an azimuth of 225°. In addition, the conference center has an area of low-slope roof acting as a bridge between the Middle and South Sisters sections, a portion of which is free of obstruction.

Figure 2. Available roof space with suitable PV tilt and azimuth; purple areas indicate possible PV locations

The indoor arena facility meter (#85868373) is billed per rate schedule 30, and is a 3,000A, 480Y/277V service fed by a 1,000 kVA General Electric transformer. A 100A breaker in the main panel acts as the POI for the existing 65 kW PV system on the east section of its main south-facing roof plane, installed in 2013 by E2 Solar. The arena roof has adequate, unobstructed space sufficient for the addition of up to roughly 450 kWDC of PV. Estimated annual load at this facility is 671 MWh, which exceeds rooftop PV capacity.

The conference center meter (#85868371) is billed per rate schedule 28, and is a 208Y/120V service fed by a 750 kVA transformer. It also has a 3,000A Siemens main distribution panel that serves ten subpanels. Four 225A breaker spaces exist at the bottom of the bus–see site limitations section for more information. This roof has adequate, unobstructed space sufficient for the addition of up to approximately 250 kWDC of PV. Estimated annual load at this building is 414 MWh, which exceeds its PV capacity.

Similar to the conference center, the auditorium's meter (#75456300) is billed per rate schedule 28, and is a 208Y/120V service. It is fed by a 300 kVA transformer, and has a 2,000A Siemens main distribution panel. The auditorium roof has adequate, unobstructed space sufficient for the addition of up to 150 kWDC of PV. Estimated annual load at this building is 299 MWh, exceeding its solar generation capacity.

2.2 Site Limitations

Free breaker space in the main distribution panel allows a newly installed PV breaker to act as the interconnection point between a new PV system and the utility grid. Space at the bottom of the main busbar makes possible–generally speaking–the interconnection of a larger solar system, as compared with breaker space higher up the bus. However, the size and configuration of the available breaker space are important factors.

While roof space is plentiful, some electrical constraints must be considered. The auditorium (North Sister) has the smallest electrical service at 2,000A, and lacks suitably configured available breaker space. A supply-side PV interconnection could circumvent this limitation in the main switchboard, however.

The arena's larger main panel has available breaker space, making either a supply-side or load-side connection feasible. However, because the arena's underlying rate schedule (30) provides a lower base electricity charge than the schedule that applies to the conference center and auditorium, the potential financial return of solar PV at this location is significantly less favorable. In the course of our investigation, Pacific Power confirmed that the underlying rate schedule cannot be changed. For this reason, the arena should be the last option considered for net metered PV, when optimizing for return on investment.

While there are four free 225A breaker spaces located in the conference center's main panel opposite the 3,000A service disconnect, they are not ideal for interconnection of a larger PV system. While it would be technically feasible to host up to four smaller PV systems, each with its own breaker disconnect, this would require as many inverters, PV AC disconnects, and drawing sets. However, as at the auditorium, a single PV interconnection is possible as a supply-side connection between the meter and main OCPD.

Methodology

The following outlines the methodology and data used to model and optimize the system to meet the goals and performance requirements for the installation of a PV system at the Deschutes County Fairgrounds. The study utilized Xendee optimization software to inform the system architecture and multiyear financial model. Helioscope software was used for PV system annual production based on design power losses and system degradation.

3.1 Electrical kWh Load Profile

As the foundation of any optimization, due diligence must be taken in creating an accurate load profile to ensure precise modeling that determines lowest net present cost while meeting project goals. Key aspects in data collection are outlined below:

- Deschutes County provided past Pacific Power electricity bills for the three meters under consideration in this study. Bills were provided for the period spanning May 2022 through May 2023, except for February, 2023.
- From these data, Mayfield constructed a synthetic load profile for the arena and conference center buildings. A medium office NREL end-use load profile in an ASHRAE 5B climate type (cool-dry, similar to Boulder, CO) was selected and scaled to represent electrical demand at the conference center. For the arena, we constructed a custom load profile to reflect a more variable special events schedule.

3.2 Tariff Rate Structure

The arena is on the schedule 30 tariff rate, and the conference center and auditorium are on schedule 28. It is assumed that electricity purchased from Pacific Power will have an escalation rate of 4% per year. Since demand charges are fees associated with infrastructure, such as improvements and maintenance of transmission and distribution lines, these demand rates still remain and are also assumed to have an annual escalation rate of 4%.

Below are base electricity rates ($/kWh) and demand rates ($/kW) for Pacific Power schedules 28 and 30:

Table 2: Pacific Power rate schedules 28 & 30

Tier	Base - sch. 28	Demand - sch.28	Base - sch. 30	Demand - sch.30
1	0.08915	7.5	0.05707	11.98
2	0.07875	6.9	0.05603	13.53
3	0.07837	6.55	0.05565	12.73
4	-	6.35	-	-

3.3 Pacific Power – Utility

Mayfield Renewables coordinated with Pacific Power to ensure that there are no infrastructural hurdles or regulations that would prevent the installation of an additional net metered PV system at the Deschutes County Fairgrounds. No such hurdles were identified during our investigation. Net metering occurs under schedule 135, which allows a maximum export of 2 MW at each meter. Meters at the same property may be virtually aggregated, and net metering credit at one meter can therefore be applied to multiple meters–including meters with differing underlying base rate schedules. However, our analysis of building load and PV generation potential indicate that aggregation will not be required to maximize financial return, even if all roof space on all facilities is fully utilized.

3.4 System Parameters

Xendee and Helioscope modeling of PV system designs was performed with the following parameters:

Equipment:

- Modeled with Hanwha Q Cells, Q.Peak DUO XL-G10.2 480W modules and SolarEdge SE66.6KUS and SE100KUS three phase 480Y/277V inverters
    - Datasheet (Appendix D), warranty degradation, production levels and efficiency used in Helioscope (Appendix C)
- Helioscope production report imported into Xendee
- 16.6 degree tilt angle for flush-mounted subarrays on 2/12 pitch standing seam roof sections with azimuth of 135°

Project:

- Project lifespan: 25 years
- Electrical export allowed
- Cost of installation ($/W) on the two facilities analyzed:
    - $3.125/W for conference center
    - $3.000/W for arena
- $0.40/kW annual maintenance cost (module cleaning)
- 30% ITC eligibility (using IRA direct pay)
- No MACRS eligibility
- Electricity rate inflation: 4%
- Financing discount rate: 5%

  - Assumed a partial cash purchase for multi year financial model

Final System Architecture

Utilizing Helioscope and Xendee, Mayfield designed a 191.5 kWDC system architecture to meet project goals while taking into account solar resource, electricity prices, installation costs, total capital expense, operating and maintenance expense, and equipment degradation. Several iterative designs and analyses led to our suggested system architecture on the conference center facility. Our optimization took into account product availability, and reflects a realistic and robust design:

- 191.5 kWDC / 166.6 kWAC PV system
- (399) Hanwha Q Cells, Q.Peak DUO XL-G10.2 480W modules
  - Flush mount racking tilted at 16.6 degrees
- (1) SolarEdge SE100KUS string inverter, 480VAC 3p
- (1) SolarEdge SE66.6KUS string inverter, 480VAC 3p
- (202) SolarEdge P1100 optimizers, one per two modules in series
- (1) 225 kVA 208Y-480Δ step up transformer

See single line diagram (Appendix B) and system layout (Appendix A) for bid-ready design package.

4.1 Product Description:

Our chosen PV modules and inverters are Tier 1 products, widely available from any EPC. Equivalent Tier 1 alternatives exist, and should be considered and evaluated based on RFP responses. High quality Hanwha Q cell modules have a module efficiency of 21.6%, a 12-year product warranty and 25-year linear performance warranty down to 86%. SolarEdge 480VAC 3p inverters and P1100 optimizers are capable of module level monitoring, have a 20 year extendible warranty, and can be configured for use with SolarEdge Data Logger, an environmental data acquisition system.

4.2 Point of Interconnection:

Because insufficient breaker space exists in the conference center main switchboard, a supply-side connection between the meter and main OCPD will be required. The meter CT is currently located inside the main panel. While a connection within the panel itself is possible, it would require further engineering analysis. Alternatively, the existing utility meter CT can easily be moved, and a connection made outside of the main panel chassis.

4.3 Consumption Offset & PV Export:

Our 191.5 kWDC flush mounted PV system design is mounted on three roof planes, all oriented at 16.6° tilt and 135° azimuth (SE). The system is estimated to produce a total of 287.7 MWh annually, offsetting 70% of the conference center's estimated annual consumption of 414 MWh. PV export is the anticipated export of the renewable resource to the grid that is not consumed by the facility at the time of production. However, this is credited to the account and then used at a later time or date, therefore not negatively affecting return on investment. The total anticipated electricity export is 88,791 kWh onto the utility grid.

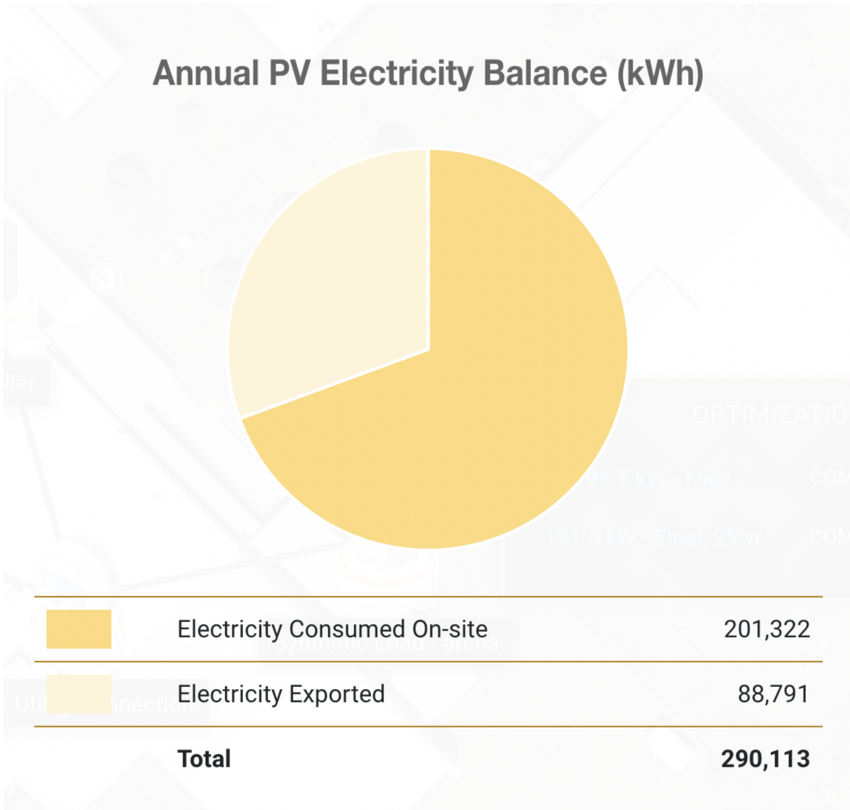


Figure 3. PV power direct consumption vs. credited power export

Multiyear Financial Model

5.1 Capital Expense and Operating Expense:

Deschutes County's financial goals in pursuing an additional PV system for the fairgrounds facilities revolve around the 1.5% GET requirement, whereby the County is presently required to allocate $600,000 for renewable energy infrastructure. Mayfield Renewables worked backwards to produce a quality PV system design based on years of engineering experience that meets this target project budget while maximizing financial return over the system lifetime.

The total estimated capital expense of $600,438 includes all PV related site prep, prevailing wage labor, bond, insurance, soft costs, engineering, materials, equipment, and operation & maintenance expenses, but excludes cost of money for financing. O&M consists of annual PV module cleaning, estimated at $1,000 per year.

5.2 System Parameters for Multiyear Financial Model:

To accurately portray a multiyear financial model the following set points were included in the analysis:

- Upfront Cash Purchase Assumed
- Project Life: 25 years
- Cash Flow Discount Rate: 5%
- PV degradation: 0.7%/yr
- Annual Demand Rate Escalation: 4%
- Annual Energy Charge Escalation: 4%

<u>5.3 Multiyear Financial Model:</u>

The below graph shows the multiyear financial analysis with revenue streams over the 25-year project lifespan. In the investment year (year zero), the capital expense is $600,000. Revenue streams begin immediately in year one, including (rounded to thousands of dollars):

- Energy export: $7,000.00
- Demand charge savings: $2,000.00
- Electrical charge savings: $18,000.00
- Federal ITC Direct Pay: $180,000.00

Modeled financial returns over the 25 year project lifespan result in:

- System payback in 13 years
- IRR of 6.38%
- NPV of discounted cash flows of $75,000.00 at end of system lifetime.
- Total operating expense savings of $977,490.00 over 25 years, or 44.5% annually

	Investment Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Revenue Increase: Electricity Sales	0	7	7	7	7	7	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5
Savings: Utility Demand Charges	0	2	2	2	2	2	2	3	3	3	4	4	4	5	5	6	6	7	7	8	9	10	11	11	12	13
Savings: Utility Energy Charges	0	18	19	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	35	36	37	39	40	41	43
Savings: DER Maintenance Costs	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Total OPEX Savings	0	26	26	27	28	29	29	30	31	32	34	35	36	37	39	40	42	43	45	47	49	51	53	54	57	59
CAPEX difference for Solar PV	-600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total CAPEX Difference	-600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal ITC Credit	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Incentives Difference	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Annual Cash Flow (Non-discounted)	-600	206	26	27	28	29	29	30	31	32	34	35	36	37	39	40	42	43	45	47	49	51	53	54	57	59
Net Annual Cash Flow (Discounted)	-600	196	24	23	23	22	22	22	21	21	21	20	20	20	20	19	19	19	19	19	18	18	18	18	18	17
Net Present Value	**-600**	**-405**	**-381**	**-358**	**-335**	**-312**	**-290**	**-269**	**-248**	**-227**	**-206**	**-186**	**-166**	**-146**	**-126**	**-107**	**-88**	**-69**	**-51**	**-32**	**-14**	**5**	**23**	**40**	**58**	**75**
Cumulative Cash Flow (Non-discounted)	-600	-395	-369	-342	-314	-285	-256	-225	-194	-162	-128	-93	-57	-20	18	58	100	143	188	235	284	334	387	442	498	557
Cumulative Cash Flow (Discounted)	-600	-376	-334	-295	-258	-224	-191	-160	-131	-104	-79	-55	-32	-11	9	28	46	63	78	93	107	120	132	144	154	165

Figure 4. Detailed project cash flow projections

Annual Electricity Charges

Tariff	Energy Category	Consumption [kWh]	Rate [$/kWh]	Energy Charge [$]
28	PTOU1 - tier1	213,295.54	-	19,015.30
28	Exports	88,790.75	-	-6,958.53
Energy Subtotal [$]				12,056.77
Reference [$]				36,963.18
Savings [$]				24,906.41

Tariff	Demand Category	Demand [kW]	Rate [$/kW]	Demand Charge [$]
28	noncoincident - tier1	50.00	-	4,500.00
28	noncoincident - tier2	44.48	-	895.17
28	noncoincident - tier3	0.00	-	0.00
28	noncoincident - tier4	37.24	-	1,276.03
Demand Subtotal [$]				6,671.20
Reference [$]				8,167.35
Savings [$]				1,496.15

Figure 5. Annual electricity charges

5.4 Comparison with Arena

Our modeling of a similar sized PV system on the arena produced less favorable financial results. Model parameters remained largely unchanged, with several small adjustments:

- A smaller installation cost of $3.00/W, because the array exists on a single roof plane
- A therefore slightly larger system size of 200 kWDC
- Lower base electrical rates, as a result of enrollment in Pacific Power schedule 30

Modeled financial returns for the arena over the 25 year project lifespan can be compared with results for the conference center, above:

- System payback in 19 years
- IRR of 2.69%
- NPV of discounted cash flows of -$109,020.00 at end of system lifetime.
- Total operating expense savings of $618,450.00 over 25 years, or 15.77% annually

Table 3: Side-by-side comparison of financial return for four modeled system architectures

Installation Location	PV Size (kW)	BESS Size (kWh)	Duration (yrs)	Yrs to Payback	IRR	Lifetime NPV	Lifetime OPEX Offset	Annual OPEX Offset
Conference Center	191.5	-	25	13	6.38%	$75,000	$977,490	44.50%
Arena	200	-	25	19	2.69%	-$109,020	$618,450	15.77%
Conference Center (w/ BESS)	90	440	15	N/A	-1.94%	-$192,110	$336,720	33.94%
Arena (w/ BESS)	124	330	15	N/A	-7.53%	-$295,860	$194,280	11.72%

Feasibility of Battery Storage

Our concept PV design does not exceed the annual electrical consumption of the Pacific Power electric meters of the auditorium, arena, and conference center. This means that all of the energy generated by solar contributes to the financial return of the system. A battery system, in the absence of time of use rate schedules geared towards energy arbitrage, can only generate revenue by offsetting demand charges. Demand charges account for roughly 20% of Deschutes County Fairgrounds' electricity costs, making a battery storage system less financially potent than PV alone. If energy resilience–the ability to use electricity during a grid outage–is not a primary goal, we do not recommend pursuing battery storage.

Electrically, adding battery storage to a PV system is feasible at all three facilities. Based on our preliminary modeling in Xendee, a $600,000 investment in solar plus battery storage at the conference center with a targeted four hour resiliency window would result in a system architecture of approximately 90 kWDC PV and 110kW/440 kWh of battery storage. A key difference with our PV optimizations is the project lifetime, which is limited to 15 years due to the shorter lifespan of battery technology. The project would result in the following financial metrics:

- No system payback during 15 year battery lifetime
- IRR of -1.94%
- NPV of discounted cash flows of -$192,110.00 at end of system lifetime
- Total operating expense savings of $336,720.00 over 15 years, or 33.94% annually

A similar alternative investment at the arena would result in a system architecture of roughly 124 kWDC PV and 80kW/330 kWh of storage. The project would result in the following financial metrics:

- No system payback during 15 year battery lifetime
- IRR of -7.53%
- NPV of discounted cash flows of -$295,860.00 at end of system lifetime
- Total operating expense savings of $194,280.00 over 15 years, or 11.72% annually

Determining optimal battery storage system size would require a detailed load analysis (e.g. one month of measurements using eGauge system, or similar) and a formal interview of the Deschutes County team to identify granular storage-related goals. These activities are outside of the scope of the present study, but could be the subject of further investigation.

Final Comments

7.1 Construction Hurdles

Mayfield does not expect major construction hurdles that would prevent installation of rooftop solar on the fairgrounds conference, auditorium, or arena. However, EPCs should take note of several site conditions that could impact particulars of the final system design and construction process. As mentioned above, the interconnection will need to be a supply-side connection. This will require coordination with Pacific Power to shut off power during installation, so that the solar can be safely connected to the service.

Additionally, the lack of available wall space in the main electrical rooms means that PV inverters must be mounted elsewhere. Our design for the conference center suggests a shaded area on the southwest-facing exterior wall (see system layout, Appendix A). Selected inverters must be rated for outdoor installation, and manufacturer specifications and warranty requirements should be followed.

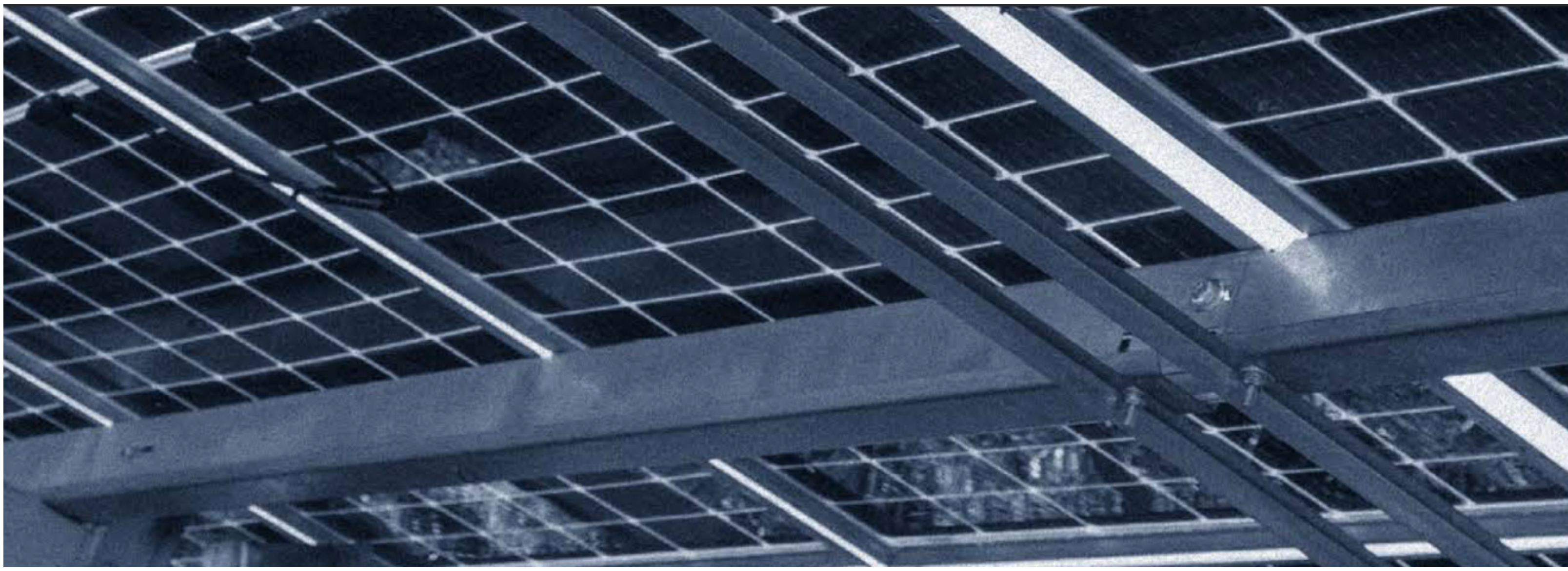
Finally, a structural engineering analysis should be completed for all roof sections on which solar will be installed. The engineer may find that structural reinforcement is required on some, or all, roof sections for PV installation. Structural analysis and reinforcement costs will increase the price-per-watt of the project. The low-slope section of the conference center is not utilized in our concept design layout, but may be utilized for additional PV deployment at the discretion of Deschutes County and the selected EPC. If this is a barrier to increasing system size, more favorable economics may be achieved by instead placing the additional PV capacity on the auditorium.

7.2 Conclusion

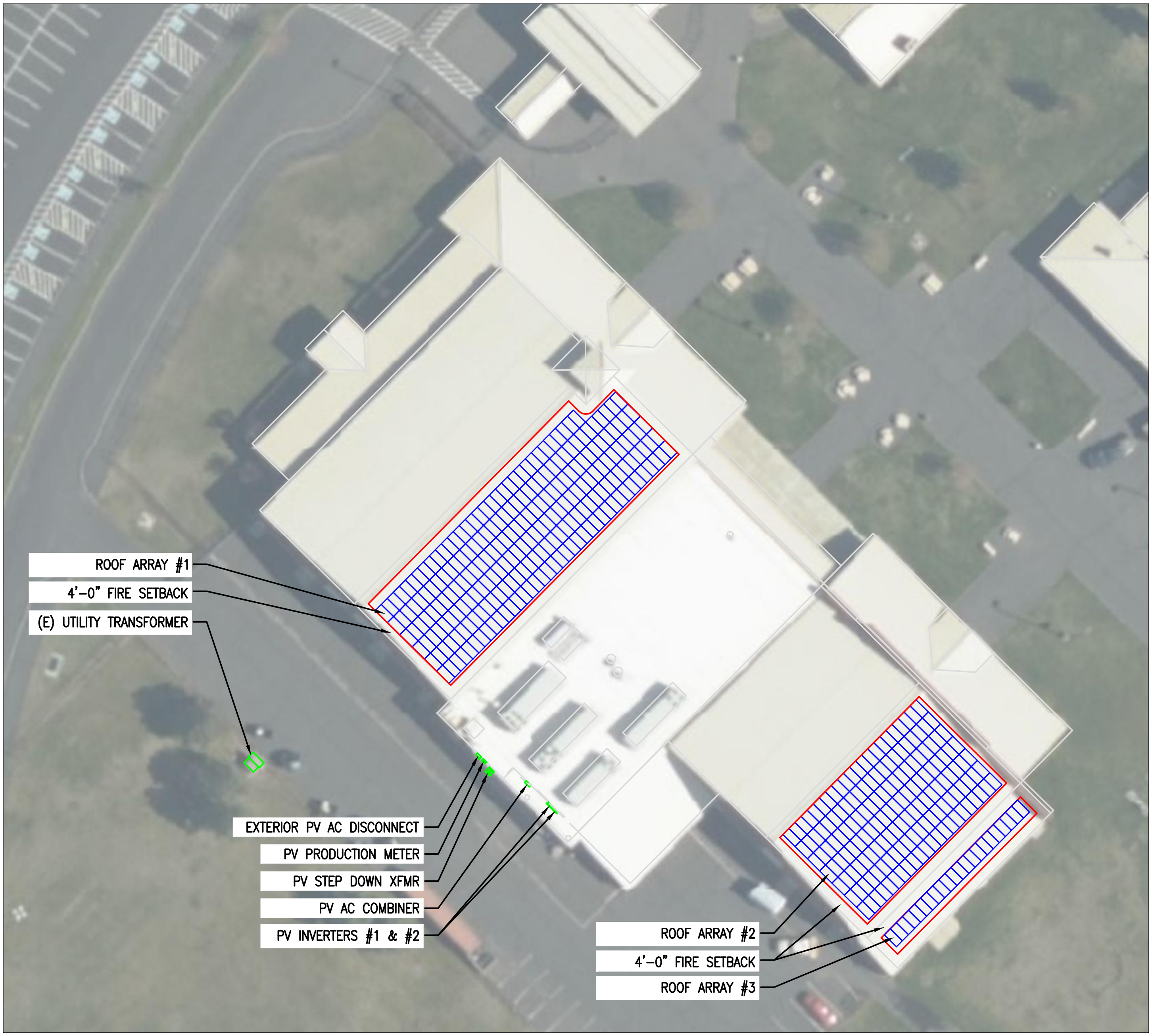
This report provides an optimal PV preliminary design to meet Deschutes County's project goals. A 191.5 kWDC PV system on the rooftop of the Deschutes County Fairgrounds conference center facility provides maximal financial return while satisfying the County's required 1.5% GET investment in renewable energy. The preliminary system design demonstrates a robust possible architecture using readily available high quality electrical components. The attached single line diagram, array layout, equipment spec sheets, and RFP system description, when incorporated into a formatted RFP, provide the detail necessary to successfully solicit bids from qualified contractors. Mayfield Renewables is capable of providing fully engineered permit and construction drawings, owner's representative services, and commissioning services.

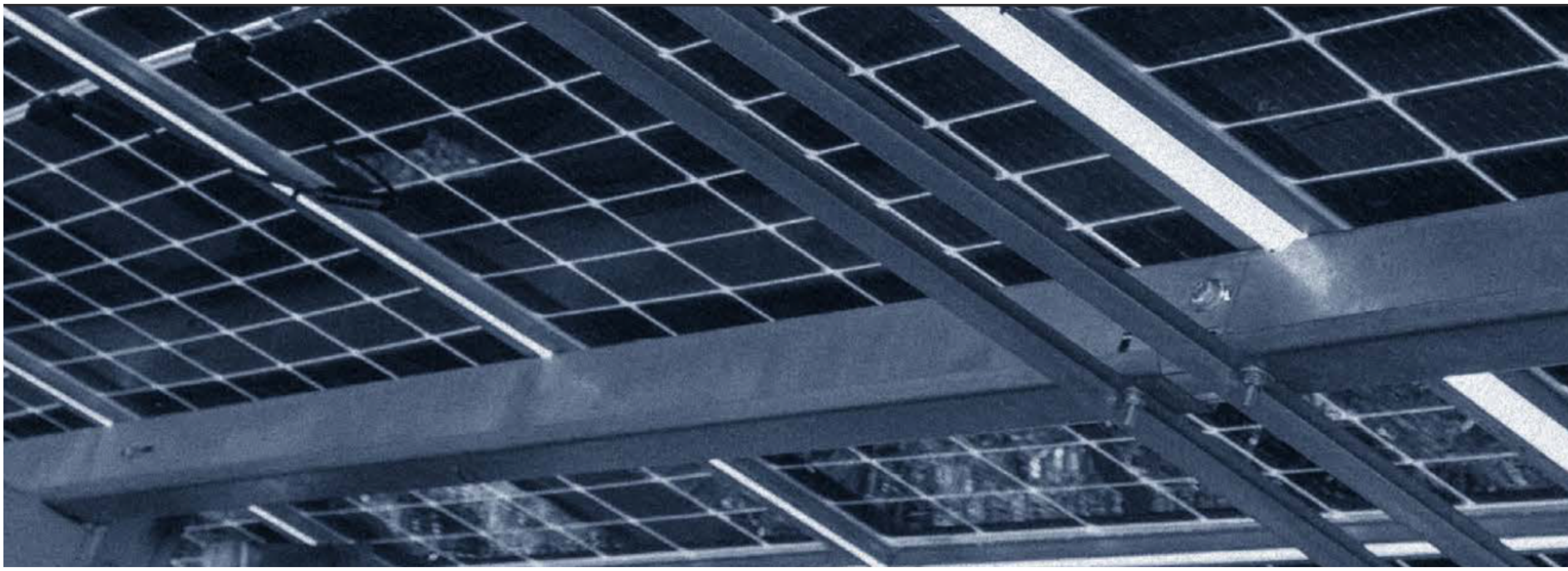
Optimization and report by:
Zach Snyder - Client Solutions Engineer
Mayfield Renewables
(719) 244-0450
zach@mayfield.energy

Reviewing SME:
Michiel Zuidweg - Senior Microgrid Specialist
Mayfield Renewables
(425) 260-1425
mac@mayfield.energy

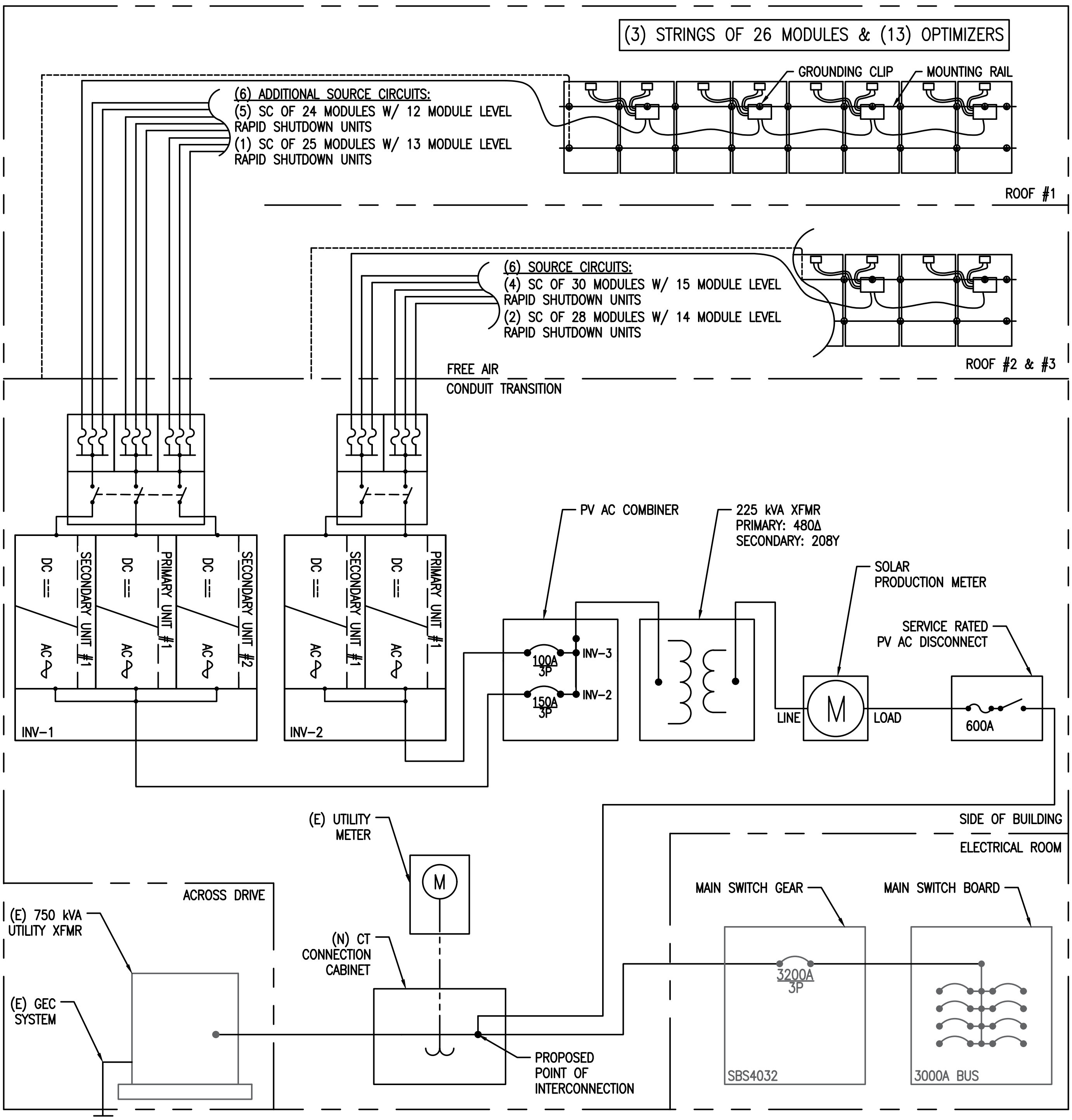


APPENDIX A:
Site Plan

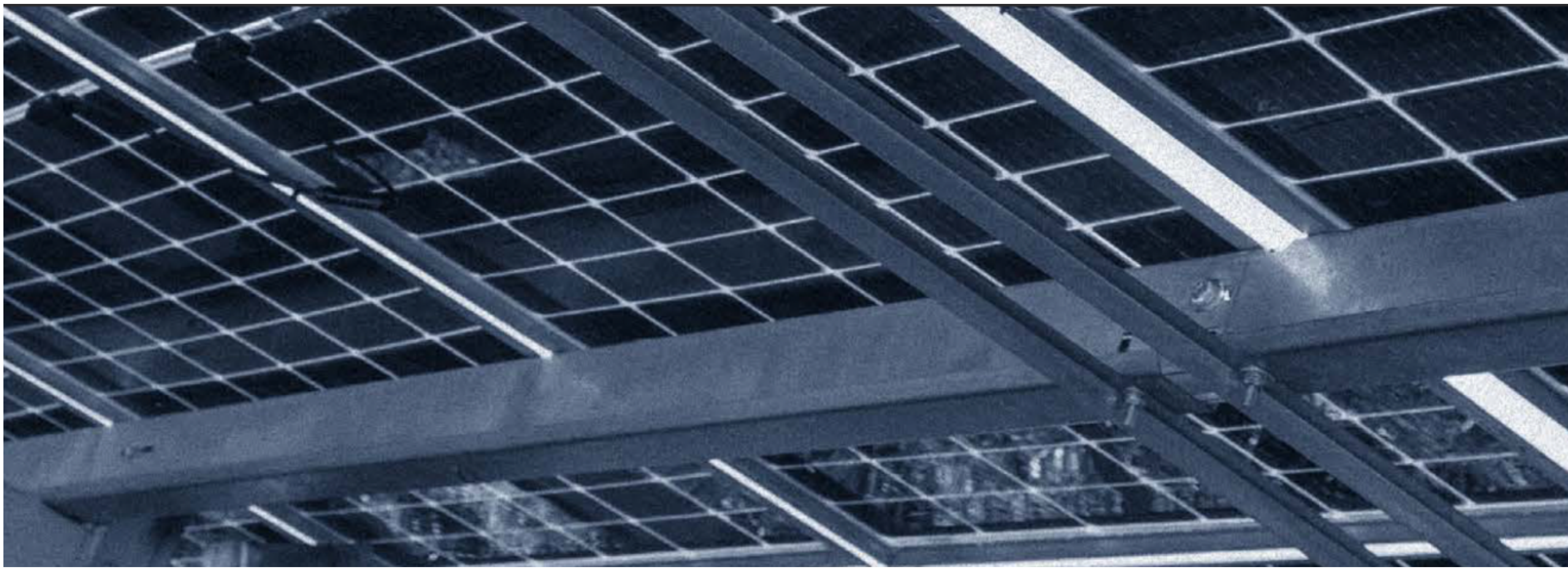

ROOF ARRAY #1
4'-0" FIRE SETBACK
(E) UTILITY TRANSFORMER
EXTERIOR PV AC DISCONNECT
PV PRODUCTION METER
PV STEP DOWN XFMR
PV AC COMBINER
PV INVERTERS #1 & #2
ROOF ARRAY #2
4'-0" FIRE SETBACK
ROOF ARRAY #3



APPENDIX B:
Single-Line Diagram



(3) STRINGS OF 26 MODULES & (13) OPTIMIZERS
GROUNDING CLIP
MOUNTING RAIL
(6) ADDITIONAL SOURCE CIRCUITS:
(5) SC OF 24 MODULES W/ 12 MODULE LEVEL RAPID SHUTDOWN UNITS
(1) SC OF 25 MODULES W/ 13 MODULE LEVEL RAPID SHUTDOWN UNITS
ROOF #1
(6) SOURCE CIRCUITS:
(4) SC OF 30 MODULES W/ 15 MODULE LEVEL RAPID SHUTDOWN UNITS
(2) SC OF 28 MODULES W/ 14 MODULE LEVEL RAPID SHUTDOWN UNITS
ROOF #2 & #3
FREE AIR
CONDUIT TRANSITION
DC
AC
SECONDARY UNIT #1
PRIMARY UNIT #1
SECONDARY UNIT #2
INV-1
INV-2
PV AC COMBINER
100A 3P
150A 3P
INV-3
INV-2
225 kVA XFMR
PRIMARY: 480Δ
SECONDARY: 208Y
SOLAR PRODUCTION METER
LINE
M
LOAD
SERVICE RATED PV AC DISCONNECT
600A
SIDE OF BUILDING
ELECTRICAL ROOM
(E) UTILITY METER
ACROSS DRIVE
(E) 750 kVA UTILITY XFMR
(E) GEC SYSTEM
(N) CT CONNECTION CABINET
PROPOSED POINT OF INTERCONNECTION
MAIN SWITCH GEAR
3200A 3P
SBS4032
MAIN SWITCH BOARD
3000A BUS



APPENDIX C:
Helioscope Report

Middle Sister - SolarEdge JCK Deschutes County Fairgrounds, 3800 SW Airport Wy, Redmond, OR 97756

Report

Project Name	Deschutes County Fairgrounds
Project Address	3800 SW Airport Wy, Redmond, OR 97756
Prepared For	Deschutes County
Prepared By	Mayfield Renewables ryan@renewableassociates.com

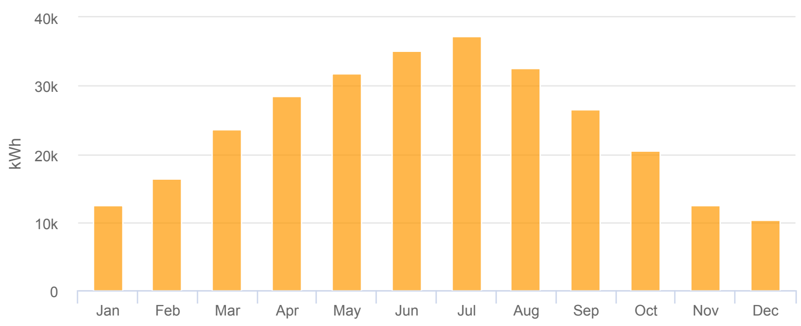
Mayfield Renewables™

System Metrics

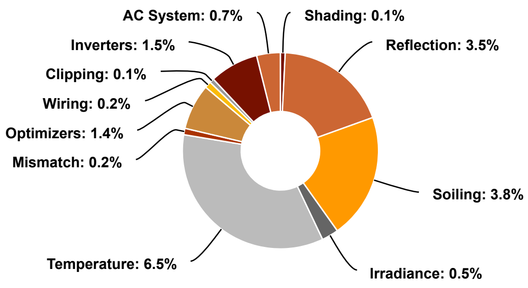
Design	Middle Sister - SolarEdge JCK
Module DC Nameplate	191.5 kW
Inverter AC Nameplate	166.6 kW Load Ratio: 1.15
Annual Production	287.7 MWh
Performance Ratio	82.7%
kWh/kWp	1,502.3
Weather Dataset	TMY, 10km Grid (44.25,-121.15), NREL (prospector)
Simulator Version	33103f8da6-e6c8ceaa45-5f8813fc95-b4f1a4023a

Project Location

Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m^2)	Annual Global Horizontal Irradiance	1,650.5	
	POA Irradiance	1,817.0	10.1%
	Shaded Irradiance	1,814.3	-0.1%
	Irradiance after Reflection	1,751.1	-3.5%
	Irradiance after Soiling	1,683.8	-3.8%
	Total Collector Irradiance	**1,683.8**	**0.0%**
Energy (kWh)	Nameplate	322,405.8	
	Output at Irradiance Levels	320,735.8	-0.5%
	Output at Cell Temperature Derate	300,033.3	-6.5%
	Output After Mismatch	299,444.5	-0.2%
	Optimizer Output	295,245.5	-1.4%
	Optimal DC Output	294,654.4	-0.2%
	Constrained DC Output	294,250.2	-0.1%
	Inverter Output	289,831.3	-1.5%
	Energy to Grid	**287,726.7**	**-0.7%**
Temperature Metrics			
	Avg. Operating Ambient Temp		9.9 °C
	Avg. Operating Cell Temp		28.2 °C
Simulation Metrics			
	Operating Hours		4708
	Solved Hours		4708

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid (44.25,-121.15), NREL (prospector)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.075	3°C
Flush Mount	-2.81	-0.0455	0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	3	5	5	6	6	3	2	2

Irradiation Variance	5%
Cell Temperature Spread	4° C
Module Binning Range	-2.5% to 2.5%
AC System Derate	0.75%

Trackers

Maximum Angle	Backtracking
60°	Enabled

Module Characterizations

Module	Uploaded By	Characterization
Q.Peak DUO XL-G10.2 480 (Hanwha Q Cells)	HelioScope	Spec Sheet Characterization, PAN

Component Characterizations

Device	Uploaded By	Characterization
SE66.6KUS (SolarEdge)	HelioScope	Spec Sheet
SE100KUS (SolarEdge)	HelioScope	Spec Sheet
P1100 (SolarEdge)	HelioScope	Mfg Spec Sheet

Components

Component	Name	Count
Inverters	SE66.6KUS (SolarEdge)	1 (66.6 kW)
Inverters	SE100KUS (SolarEdge)	1 (100.0 kW)
AC Panels	1 input AC Panel	2
AC Home Runs	500 MCM (Copper)	2 (5,777.3 ft)
Strings	10 AWG (Copper)	14 (1,201.5 ft)
Optimizers	P1100 (SolarEdge)	202 (222.2 kW)
Module	Hanwha Q Cells, Q.Peak DUO XL-G10.2 480 (480W)	399 (191.5 kW)

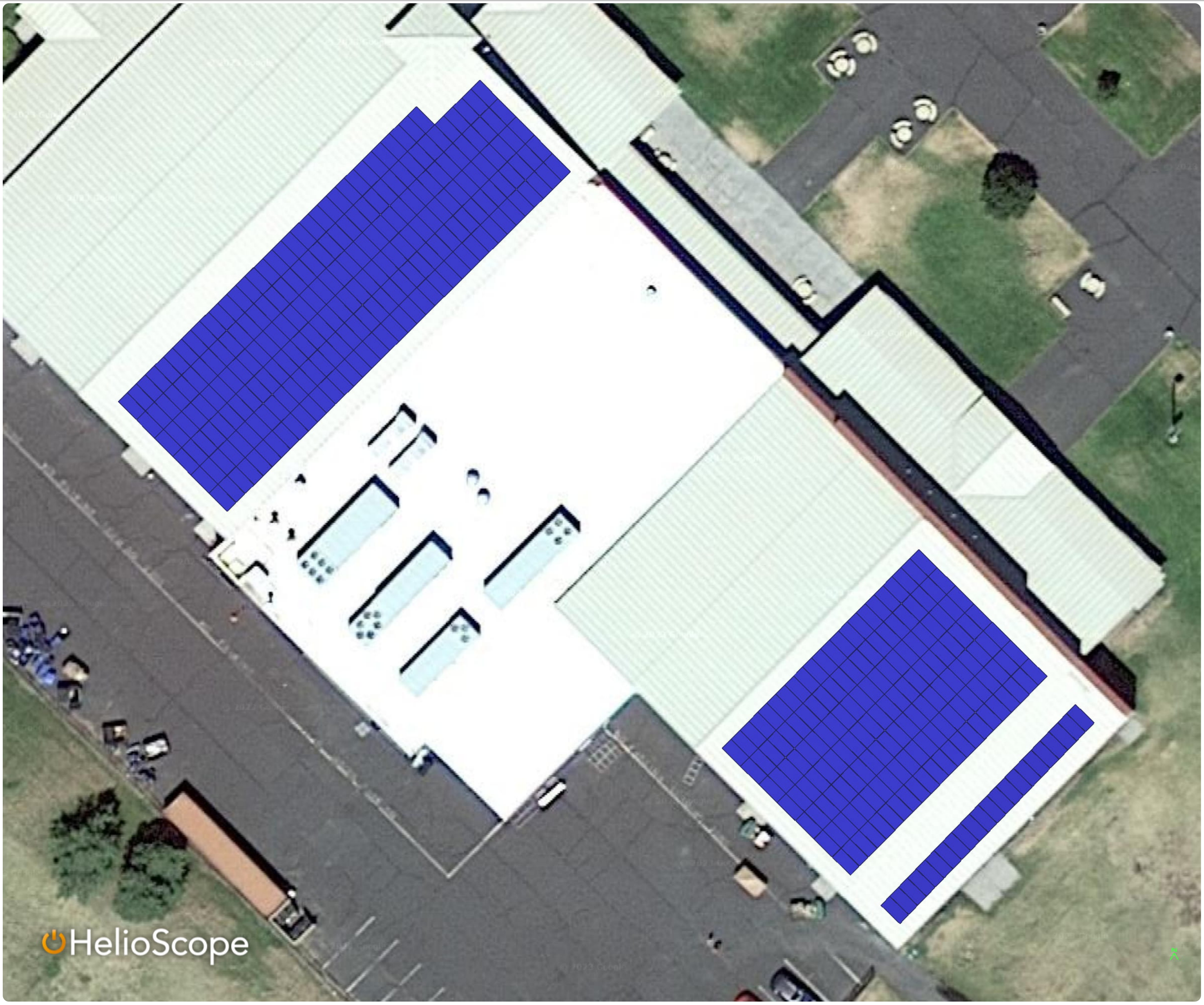
Wiring Zones

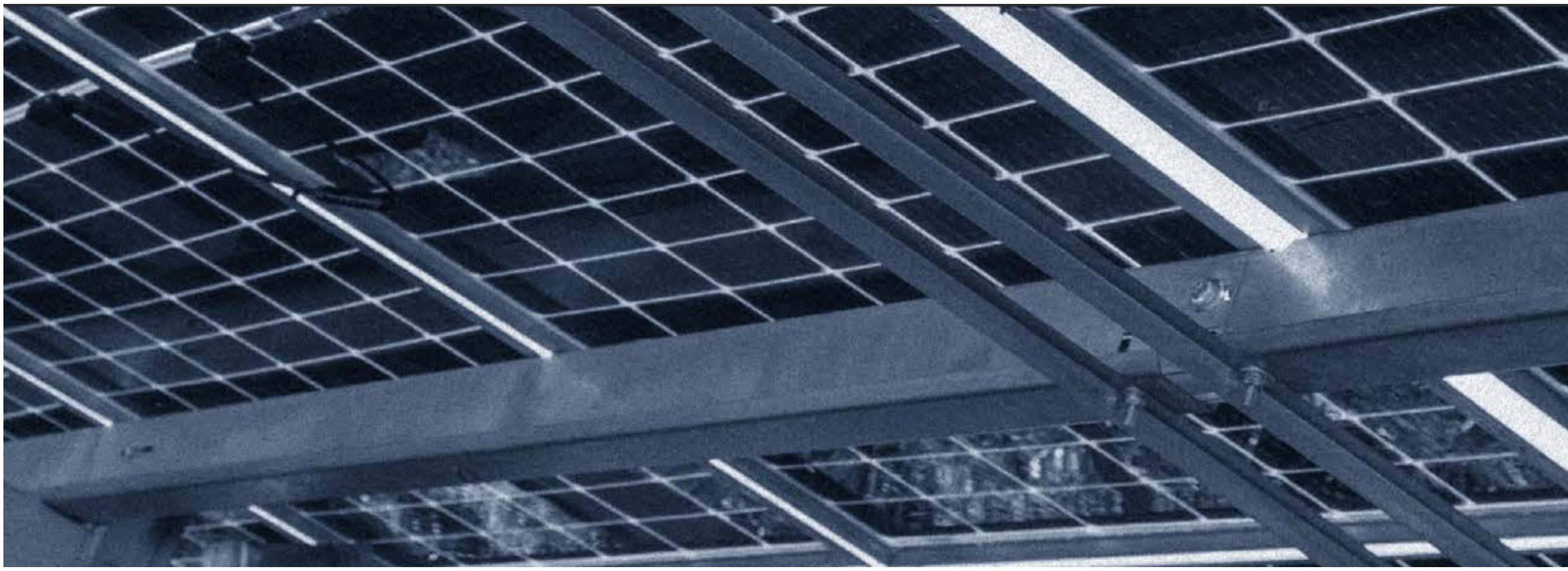
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	13-31	Along Racking
Wiring Zone 2	-	13-31	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 2	Flush Mount	Portrait (Vertical)	16.67°	135.3°	0.0 ft	1x1	223	223	107.0 kW
Field Segment 3	Flush Mount	Portrait (Vertical)	16.67°	134.68228°	0.0 ft	1x1	154	154	73.9 kW
Field Segment 4	Fixed Tilt	Portrait (Vertical)	10°	134.04517°	2.7 ft	1x1	22	22	10.6 kW

Detailed Layout





APPENDIX D:
PV & Inverter Datasheets

powered by Q.ANTUM DUO Z

PRELIMINARY

Q.PEAK DUO XL-G10.2

475-495

ENDURING HIGH PERFORMANCE

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2020

Q CELLS Yield Security

BREAKING THE 21 % EFFICIENCY BARRIER
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 21.6 %.

LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area, lower BOS costs and up to 80 watts more module power than standard 144 half-cell modules.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative 12-busbar design with Q.ANTUM Technology.

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (−1500 V, 168 h)

[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

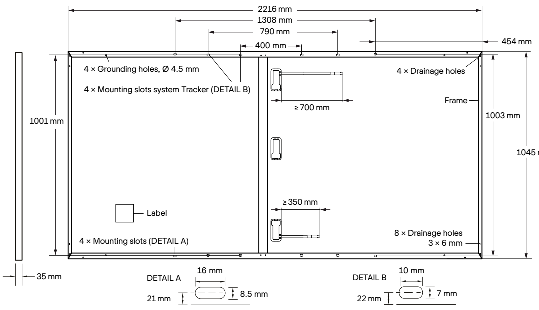
Ground-mounted solar power plants

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	2216 mm × 1045 mm × 35 mm (including frame)
Weight	26.5 kg
Front Cover	3.2 mm thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodised aluminium
Cell	6 × 26 monocrystalline Q.ANTUM solar half cells
Junction box	53-101 mm × 32-60 mm × 15-18 mm Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥700 mm, (–) ≥350 mm*
Connector	Stäubli MC4-Evo2, Hanwha Q CELLS HQC4; IP68
	*Long cables (+) ≥1450 mm, (–) ≥1450 mm for landscape installation are available upon request.

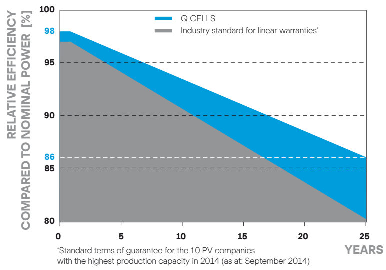


ELECTRICAL CHARACTERISTICS

POWER CLASS				475	480	485	490	495
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / –0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	475	480	485	490	495
	Short Circuit Current[1]	I_{SC}	[A]	11.24	11.26	11.29	11.31	11.34
	Open Circuit Voltage[1]	V_{OC}	[V]	53.58	53.61	53.64	53.68	53.71
	Current at MPP	I_{MPP}	[A]	10.66	10.71	10.76	10.81	10.86
	Voltage at MPP	V_{MPP}	[V]	44.54	44.81	45.07	45.33	45.59
	Efficiency[1]	η	[%]	≥20.5	≥20.7	≥20.9	≥21.2	≥21.4
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	356.4	360.1	363.9	367.6	371.4
	Short Circuit Current	I_{SC}	[A]	9.05	9.07	9.09	9.12	9.14
	Open Circuit Voltage	V_{OC}	[V]	50.53	50.56	50.59	50.62	50.65
	Current at MPP	I_{MPP}	[A]	8.39	8.43	8.47	8.52	8.56
	Voltage at MPP	V_{MPP}	[V]	42.49	42.72	42.94	43.17	43.39

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2 °C, AM 1.5 according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5

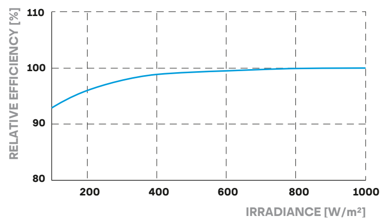
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[% / K]	+0.04	Temperature Coefficient of V_{OC}	β	[% / K]	–0.27
Temperature Coefficient of P_{MPP}	γ	[% / K]	–0.34	Nominal Module Operating Temperature	NMOT	[°C]	43±3

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage	V_{SYS}	[V]	1500	PV module classification	Class II
Maximum Reverse Current	I_R	[A]	20	Fire Rating based on ANSI / UL 61730	C / TYPE 1
Max. Design Load, Push / Pull		[Pa]	3600 / 1600	Permitted Module Temperature on Continuous Duty	–40 °C - +85 °C
Max. Test Load, Push / Pull		[Pa]	5400 / 2400		

QUALIFICATIONS AND CERTIFICATES

IEC 61215:2016;
IEC 61730:2016.
This data sheet complies with DIN EN 50380.

Certification in process.

TÜVRheinland CERTIFIED
www.tuv.com
ID 1111220277

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS GmbH
Sonnenallee 17-21, 06766 Bitterfeld-Wolfen, Germany | **TEL** +49 (0)3494 66 99-23444 | **FAX** +49 (0)3494 66 99-23000 | **EMAIL** sales@q-cells.com | **WEB** www.q-cells.com

Engineered in Germany

Three Phase Inverters with Synergy Technology

For the 277/480V Grid

SE66.6K / SE100K

INVERTERS

Specifically designed to work with power optimizers

- Easy two-person installation – each unit mounted separately, equipped with cables for simple connection between units
- Balance of System and labor reduction compared to using multiple smaller string inverters
- Independent operation of each unit enables higher uptime and easy serviceability
- No wasted ground area: wall/rail mounted or horizontally mounted under the modules (10˚ inclination)
- Built-in module-level monitoring with Ethernet or cellular GSM
- Fixed voltage inverter for superior efficiency (98.1%) and longer strings
- Integrated Connection Unit with optional integrated DC Safety Switch – eliminates the need for external DC isolators
- Built-in RS485 Surge Protection, to better withstand lightning events
- Advanced safety features - integrated arc fault protection and rapid shutdown
- 135% DC oversizing, enabling higher energy production

/ Three Phase Inverter with Synergy Technology

For the 277/480V Grid

SE66.6K / SE100K

	SE66.6K	SE100K	
OUTPUT			
Rated AC Power Output	66600	100000	VA
Maximum AC Power Output	66600	100000	VA
AC Output Voltage — Line to Line / Line to Neutral (Nominal)	480 / 277		Vac
AC Output Voltage — Line to Line Range; Line to Neutral Range	432 - 528 / 249.3 - 304.7		Vac
AC Frequency	50/60 ± 5		Hz
Maximum Continuous Output Current (per Phase) @277V	80	120	A
Grids Supported — Three Phase	3 / N / PE (WYE with Neutral)		V
Maximum Residual Current Injection(1)	250 per unit		mA
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes		
INPUT			
Maximum DC Power (Module STC), Inverter / Unit	90000 / 45000	135000 / 45000	W
Transformer-less, Ungrounded	Yes		
Maximum Input Voltage	1000		Vdc
Operating Voltage Range	680 - 1000		Vdc
Maximum Input Current	2 x 40	3 x 40	Adc
Reverse-Polarity Protection	Yes		
Ground-Fault Isolation Detection	350kΩ Sensitivity per Unit(2)		
Maximum Inverter Efficiency	98.1		%
European Weighted Efficiency	98		%
Nighttime Power Consumption	< 12		W
ADDITIONAL FEATURES			
Supported Communication Interfaces(3)	RS485, Ethernet, GSM plug-in (optional)		
RS485 Surge Protection	Built-in		
Rapid Shutdown	Optional(4) (Automatic upon AC Grid Disconnect)		
Cable Covers	Ordered separately with part number: DCD-SGY-COVER-LP (for SE66.6K) DCD-SGY-COVER-HP (for SE100K) ; Dimensions (H x W x D) – 314.3 x 343.7 x 134.5 mm		
CONNECTION UNIT			
DC Disconnect (optional)	1000V / 2 x 40A	1000V / 3 x 40A	
STANDARD COMPLIANCE			
Safety	IEC-62109, AS3100		
Grid Connection Standards(5)	VDE-AR-N-4105, G59/3, AS-4777,EN 50438 , CEI-021,VDE 0126-1-1, CEI-016, BDEW		
Emissions	IEC61000-6-2, IEC61000-6-3 , IEC61000-3-11, IEC61000-3-12		
RoHS	Yes		
INSTALLATION SPECIFICATIONS			
Number of units	2	3	
AC Output Cable	Cable gland — diameter 22-32; PE gland diameter 10-16	Cable gland — diameter 30-38; PE gland diameter 10-16	mm
DC Input(6)	6 strings, 4-10mm² DC wire, gland outer diameter 5-10mm / 3 MC4 pairs per unit	9 strings, 4-10mm² DC wire, gland outer diameter 5-10mm / 3 MC4 pairs per unit	
AC Output Wire	Aluminum or Copper; L, N: Up to 70, PE: Up to 35	Aluminum or Copper; L, N: Up to 95, PE: Up to 50	mm²
Dimensions (H x W x D)	Primary Unit: 940 x 315 x 260; Secondary Unit: 540 x 315 x 260		mm
Weight	Primary Unit: 48; Secondary Unit 45		kg
Operating Temperature Range	-40 to +60(7)		°C
Cooling	Fan (user replaceable)		
Noise	< 60		dBA
Protection Rating	IP65 — outdoor and indoor		
Mounting	Brackets provided		

(1) If an external RCD is required, its trip value must be ≥ 300mA per unit (≥ 600mA for SE66.6K; ≥ 900mA for SE100K)
(2) Where permitted by local regulations
(3) Refer to Datasheets -> Communications category on Downloads page for specifications of optional communication options: http://www.solaredge.com/groups/support/downloads
(4) Inverter with rapid shutdown part number: SE100K-RWRP0BNU4; Available for SE100K
(5) For all standards refer to Certifications category on Downloads page: http://www.solaredge.com/groups/support/downloads
(6) The DC input type, MC4 or glands, and DC switch depends on the part number ordered. Inverter with glands and DC switch P/N: SExxK-xx0P0BNG4, inverter with glands and without DC switch P/N: SExxKxx 0P0BNA4, inverter with MC4 and with DC switch P/N: SExxK-xx0P0BNU4, inverter with MC4 and without DC switch P/N: SExxK-xx0P0BNY4
(7) For power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note.pdf

Power Optimizer

P605 / P650 / P701 / P730 / P800p / P801 / P850 / P950 / P1100

POWER OPTIMIZER

PV power optimization at the module level

The most cost-effective solution for commercial and large field installations

- Specifically designed to work with SolarEdge inverters
- High efficiency with module-level MPPT, for maximized system energy production and revenue, and fast project ROI
- Superior efficiency (99.5%)
- Balance of System cost reduction; 50% less cables, fuses, and combiner boxes, and over 2x longer string lengths possible
- Fast installation with a single bolt
- Advanced maintenance with module level monitoring
- Module level voltage shutdown for installer and firefighter safety
- Use with two PV modules connected in series or in parallel

/ Power Optimizer

P605 / P650 / P701 / P730 / P801

Power Optimizer Module (Typical Module Compatibility)	P605 (for 1 x high power PV module)	P650 (for up to 2 x 60-cell PV modules)	P701 (for up to 2 x 60/120-cell PV modules)	P730 (for up to 2 x 72-cell PV modules)	P801 (for up to 2 x 72/144 cell PV modules)	
INPUT						
Rated Input DC Power(1)	605	650	700*	730**	800	W
Connection Method	Single input for series connected modules					
Absolute Maximum Input Voltage (Voc at lowest temperature)	65	96		125		Vdc
MPPT Operating Range	12.5 – 65	12.5 – 80		12.5 – 105		Vdc
Maximum Short Circuit Current per Input (Isc)	14.1	11	11.75	11**	12.5***	Adc
Maximum Efficiency	99.5					%
Weighted Efficiency	98.6					%
Overvoltage Capacity	II					
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER						
Maximum Output Current	15					Adc
Maximum Output Voltage	80					Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF						
Safety Output Voltage per Power Optimizer	1 ± 0.1					Vdc
STANDARD COMPLIANCE						
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3					
Safety	IEC62109-1 (class II safety)					
RoHS	Yes					
Fire Safety	VDE-AR-E2100-712:2013-05					
INSTALLATION SPECIFICATIONS						
Compatible SolarEdge Inverters	Three Phase Inverter SE16K & larger					
Maximum Allowed System Voltage	1000					Vdc
Dimensions (W x L x H)	129 x 153 x 52 / 5.1 x 6 x 2	129 x 153 x 42.5 / 5.1 x 6 x 1.7		129 x 153 x 49.5 / 5.1 x 6 x 1.9		mm / in
Weight	1064 / 2.3	834 / 1.8		933 / 2.1		gr / lb
Input Connector	MC4(2)					
Input Wire Length	0.16 / 0.52			0.16 / 0.52, 0.9 / 2.95(3)		m / ft
Output Connector	MC4					
Output Wire Length	Portrait Orientation: 1.4 / 4.5	Portrait Orientation: 1.2 / 3.9	-	Portrait Orientation: 1.2 / 3.9		m / ft
	-	Landscape Orientation: 1.8 / 5.9		Landscape Orientation: 2.2 / 7.2		
Operating Temperature Range(6)	-40 to +85 / -40 to +185					ºC / ºF
Protection Rating	IP68 / NEMA6P					
Relative Humidity	0 – 100					%

* For P701 models manufactured after work week 06/2020, the rated DC input is 740W.
** For P730 models manufactured after work week 06/2020, the rated DC input is 760W and the maximum Isc per input is 11.75A.
*** For P801 models manufactured in work week 40/2020 or earlier, the maximum Isc per input in 11.75A.
(1) The rated power of the module at STC will not exceed the Power Optimizer "Rated Input DC Power". Modules with up to +5% power tolerance are allowed.
(2) For other connector types, please contact SolarEdge.
(3) Longer input wire lengths are available for use with split junction box modules. For 0.9m/2.95ft order P730-xxxLxxx.
(4) For ambient temperatures above +70ºC / +158ºF, power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details.

PV System Design Using a SolarEdge Inverter(5)(6)(7)(8)		230/400V Grid SE16K, SE17 SE25K*, SE33.3K*		230/400V Grid SE27.6K*		230/400V Grid SE30K*		277/480V Grid SE33.3K*, SE40K*		
Compatible Power Optimizers		P605	P650, P701, P730, P801	P605	P650, P701, P730, P801	P605	P650, P701, P730, P801	P605	P650, P701, P730, P801	
Minimum String Length	Power Optimizers	14	14	14	14	15	15	14	14	
	PV Modules	14	27	14	27	15	29	14	27	
Maximum String Length	Power Optimizers	30	30	30	30	30	30	30	30	
	PV Modules	30	60	30	60	30	60	30	60	
Maximum Continuous Power per String		11250		11625		12750		12750		W
Maximum Allowed Connected Power per String(8) (Permitted only when the difference in connected power between strings is 2,000W or less)		13500		13500		15000		15000		W
Parallel Strings of Different Lengths or Orientations		Yes								
Maximum Difference in Number of Power Optimizers Allowed Between the Shortest and Longest String Connected to the Same Inverter Unit		5 Power Optimizers								

* The same rules apply for Synergy units of equivalent power ratings that are part of the modular Synergy Technology Inverter.
(5) P650/P701/P730/P801 can be mixed in one string only with P650/P701/P730/P801. P605 cannot be mixed with any other Power Optimizer in the same string.
(6) For each string, a Power Optimizer may be connected to a single PV module if 1) each Power Optimizer is connected to a single PV module or 2) it is the only Power Optimizer connected to a single PV module in the string.
(7) For SE16K and above, the minimum STC DC connected power should be 11KW.
(8) To connect more STC power per string, design your project using SolarEdge Designer.

Power Optimizer

P800p / P850 / P950 / P1100

Power Optimizer Module (Typical Module Compatibility)	P800p (for up to 2 x 96-cell 5'' PV modules)	P850 (for up to 2 x high power or bi-facial modules)	P950 (for up to 2 x high power or bi-facial modules)	P1100 (for up to 2 x high power or bi-facial modules)	Unit
INPUT					
Rated Input DC Power[1]	800	850	950	1100	W
Connection Method	Dual input for independently connected	Single input for series connected modules			
Absolute Maximum Input Voltage (Voc at lowest temperature)	83	125			Vdc
MPPT Operating Range	12.5 – 83	12.5 – 105			Vdc
Maximum Short Circuit Current per Input (Isc)	7	14.1*		14.1	Adc
Maximum Efficiency	99.5				%
Weighted Efficiency	98.6				%
Overvoltage Capacity	II				
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER					
Maximum Output Current	18				Adc
Maximum Output Voltage	80				Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF					
Safety Output Voltage per Power Optimizer	1 ± 0.1				Vdc
STANDARD COMPLIANCE					
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3				
Safety	IEC62109-1 (class II safety)				
RoHS	Yes				
Fire Safety	VDE-AR-E2100-712:2013-05				
INSTALLATION SPECIFICATIONS					
Compatible SolarEdge Inverters	Three Phase Inverter SE16K & larger			Three Phase Inverter SE25K & larger	
Maximum Allowed System Voltage	1000				Vdc
Dimensions (W x L x H)	129 x 168 x 59 / 5.1 x 6.61 x 2.32	129 x 162 x 59 / 5.1 x 6.4 x 2.32			mm / in
Weight	1064 / 2.3				gr / lb
Input Connector	MC4[2]				
Input Wire Length	0.16 / 0.52	0.16 / 0.52, 0.9 / 2.95, 1.3 / 4.26, 1.6 / 5.24[3]	0.16 / 0.52, 1.3 / 4.26, 1.6 / 5.24[3]	0.16 / 0.52, 1.3 / 4.26[3]	m / ft
Output Connector	MC4				
Output Wire Length	Portrait Orientation: 1.2 / 3.9			2.4 / 7.8	m / ft
	Landscape Orientation: 1.8 / 5.9	Landscape Orientation: 2.2 / 7.2			
Operating Temperature Range[4]	-40 to +85 / -40 to +185				ºC / ºF
Protection Rating	IP68 / NEMA6P				
Relative Humidity	0 – 100				%

* For P850/P950 models manufactured in work week 06/2020 or earlier, the maximum Isc per input is 12.5A. The manufacture code is indicated in the Power Optimizer's serial number. Example: S/N SJ0620A-xxxxxxxx (work week 06 in 2020)

(1) The rated power of the module at STC will not exceed the Power Optimizer "Rated Input DC Power". Modules with up to +5% power tolerance are allowed.

(2) For other connector types, please contact SolarEdge.

(3) Longer input wire lengths are available for use with split junction box modules. For 0.9m/2.95ft order P801/P850-xxxLxxx. For 1.3m/2.95ft order P850/P950/P1100 -xxxXxxx. For 1.6m/5.24ft order P850/P950-xxxYxxx).

(4) For ambient temperatures above +70ºC / +158ºF, power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details.

PV System Design Using a SolarEdge Inverter[5][6][7][8]		230/400V Grid SE16K, SE17K	230/400V Grid SE25K*	230/400V Grid SE27.6K*	230/400V Grid SE30K*	230/400V Grid SE33.3K	277/480V Grid SE33.3K*, SE40K*	
Compatible Power Optimizers		P800p, P850, P950	P800p, P850, P950, P1100	P800p, P850, P950, P1100	P800p, P850, P950, P1100	P800p, P850, P950, P1100	P800p, P850, P950, P1100	
Minimum String Length	Power Optimizers	14	14	14	15	14	14	
	PV Modules	27	27	27	29	27	27	
Maximum String Length	Power Optimizers	30	30	30	30	30	30	
	PV Modules	60	60	60	60	60	60	
Maximum Continuous Power per String		13500	13500	13950	15300	13500	15300	W
Maximum Allowed Connected Power per String[8] (Permitted only when the difference in connected power between strings is 2,000W or less)		1 string – 15750	1 string – 15750	1 string – 16200	1 string – 17550	2 strings or less – 15750	2 strings or less – 17550	W
		2 strings or more – 18500	2 strings or more – 18500	2 strings or more – 18950	2 strings or more – 20300	3 strings or more – 18500	3 strings or more – 20300	
Parallel Strings of Different Lengths or Orientations		Yes						
Maximum Difference in Number of Power Optimizers Allowed Between the Shortest and Longest String Connected to the Same Inverter Unit		5 Power Optimizers						

* The same rules apply for Synergy units of equivalent power ratings that are part of the modular Synergy Technology Inverter.

(5) P800p/P850/P950/P1100 can be mixed in one string only with P800p/P850/P950/P1100.

(6) For each string, a Power Optimizer may be connected to a single PV module if 1) each Power Optimizer is connected to a single PV module or 2) it is the only Power Optimizer connected to a single PV module in the string.

(7) For SE16K and above, the minimum STC DC connected power should be 11KW.

(8) To connect more STC power per string, design your project using SolarEdge Designer.

SolarEdge is a global leader in smart energy technology. By leveraging world-class engineering capabilities and with a relentless focus on innovation, SolarEdge creates smart energy solutions that power our lives and drive future progress.

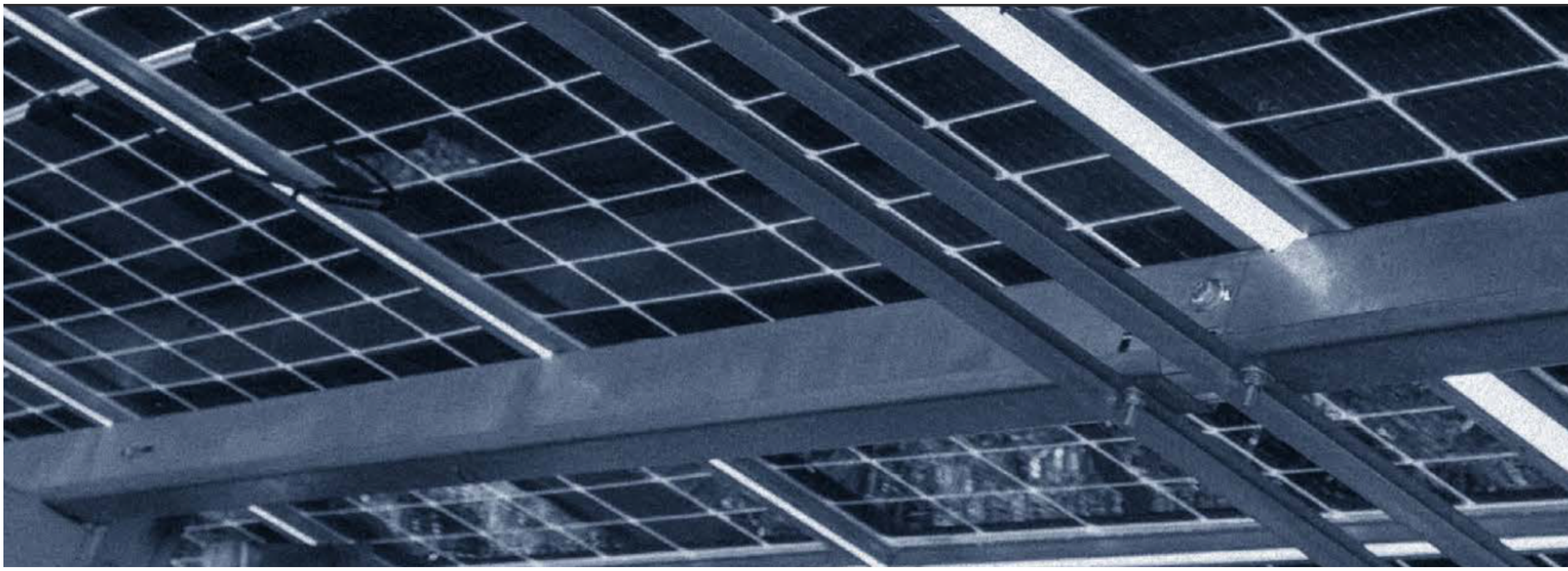
SolarEdge developed an intelligent inverter solution that changed the way power is harvested and managed in photovoltaic (PV) systems. The SolarEdge DC optimized inverter maximizes power generation while lowering the cost of energy produced by the PV system.

Continuing to advance smart energy, SolarEdge addresses a broad range of energy market segments through its PV, storage, EV charging, UPS, and grid services solutions.

SolarEdge
@SolarEdgePV
@SolarEdgePV
SolarEdgePV
SolarEdge
www.solaredge.com/corporate/contact

solaredge.com

CE



APPENDIX E:
Xendee Report

Results Report for

Deschutes County Fairgrounds - Conference Center

XENDEE

XENDEE

Prepared by **Zach Snyder**

Created on **Thursday, July 27, 2023**

Table of Contents

3.37%

Internal Rate of Return

Model Input

Deschutes County Fairgrounds - Conference Center

3800 SW Airport Wy, Redmond, OR 97756, USA

Objectives

Minimize cost.

Financing

Interest Rate	**0.00 %**
Investment Tax Credit	**Yes**
MACRS	**Yes**

Energy Costs

Energy Price	**N/A**
Avg. Natural Gas Cost	**N/A**
Avg. Diesel Fuel Cost	**N/A**
Reference LCOE	**$0.11 / kWh**

Demand Charges

Peak TOU Rate	**N/A**
Non-Coincident	**N/A**

Demand Characteristics

Peak Demand	**96 kW**
Annual Consumption	**415 MWh**
Schedulable EV	**N/A**

Financial Indicators for Investment

$-203,020	**$-69,720**	**16 Years**
Project NPV (at year 12)	Project NPV (at year 25)	Payback Period

Impact

$600,440	**-10.5%**	**68.3%**
Upfront Capital Cost	Annual Cost Reductions	Emission Savings

XENDEE

Project: Deschutes County Fairgrounds - Conference Center

Address: 3800 SW Airport Wy, Redmond, OR 97756, USA

Analysis: 191.5 kW - Final

Date: 7/25/2023

Equations: 163,997

Runtime: 27 seconds

	Total Annual Energy Costs (dollars in thousands)	Total Annual CO_2 Emissions (metric tons)
Reference	$47	239
Investment scenario (incl. annualized capital costs and electricity sales)	$51.9	76
Total Savings (%) (incl. annualized capital costs and electricity sales)	-10.5 %	68.3 %

Result	Value
Interest Rate	0.00 %
OPEX Savings (%)	54.3%
Generation-Based Levelized Cost of Electricity ($ / kWh)	$0.1031
Load-Served Levelized Cost of Electricity ($ / kWh)	$0.1252
Simple Project Break-Even Year	More than 20 years
Detailed Project Break-Even Year	17 years
Simple Project Payback Period	More than 20 years
Detailed Project Payback Period	17 years
Xendee Project Savings to Investment Ratio	1.06
NPV at End of Project (dollars in thousands)	$-70
IRR at End of Project	3.4%

Type	Total New Capacity	Technology (New Capacity)
	192 kW	Solar PV (192 kW)

Summary

Provided in this section is an overview of projected annual costs and savings over a twenty-year period. Annualized Energy Costs summarizes the annualized operational and investment costs of the optimized microgrid, and the Costs and Savings Projection (Non-Discounted) presents costs as upfront investment capital, yearly operational expenses, and accumulated savings based on results from the year optimized.

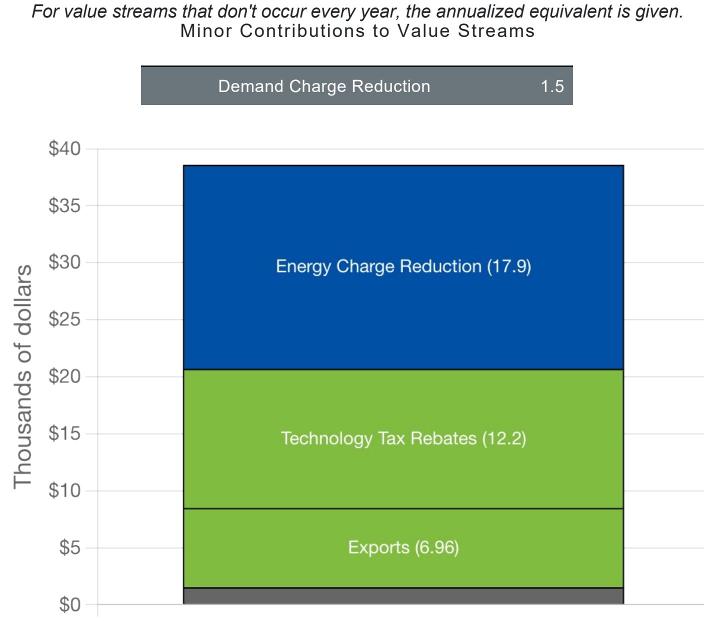
Value Streams

Considered Value Streams

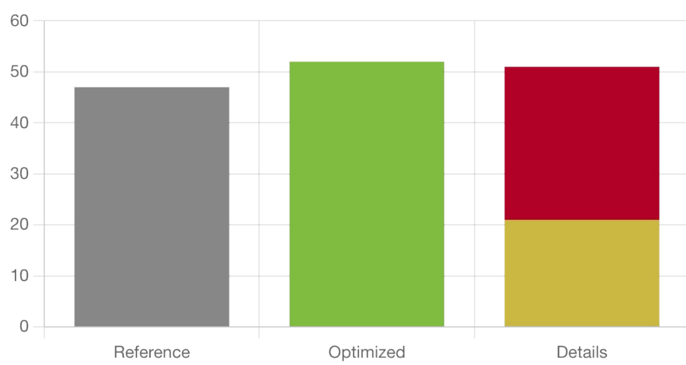
- Technology Tax Rebates
- Exports
- Demand Charge Reduction
- Energy Charge Reduction

Annualized Exploited Value Streams

All values in thousands of dollars and are relative to the reference case.
For value streams that don't occur every year, the annualized equivalent is given.

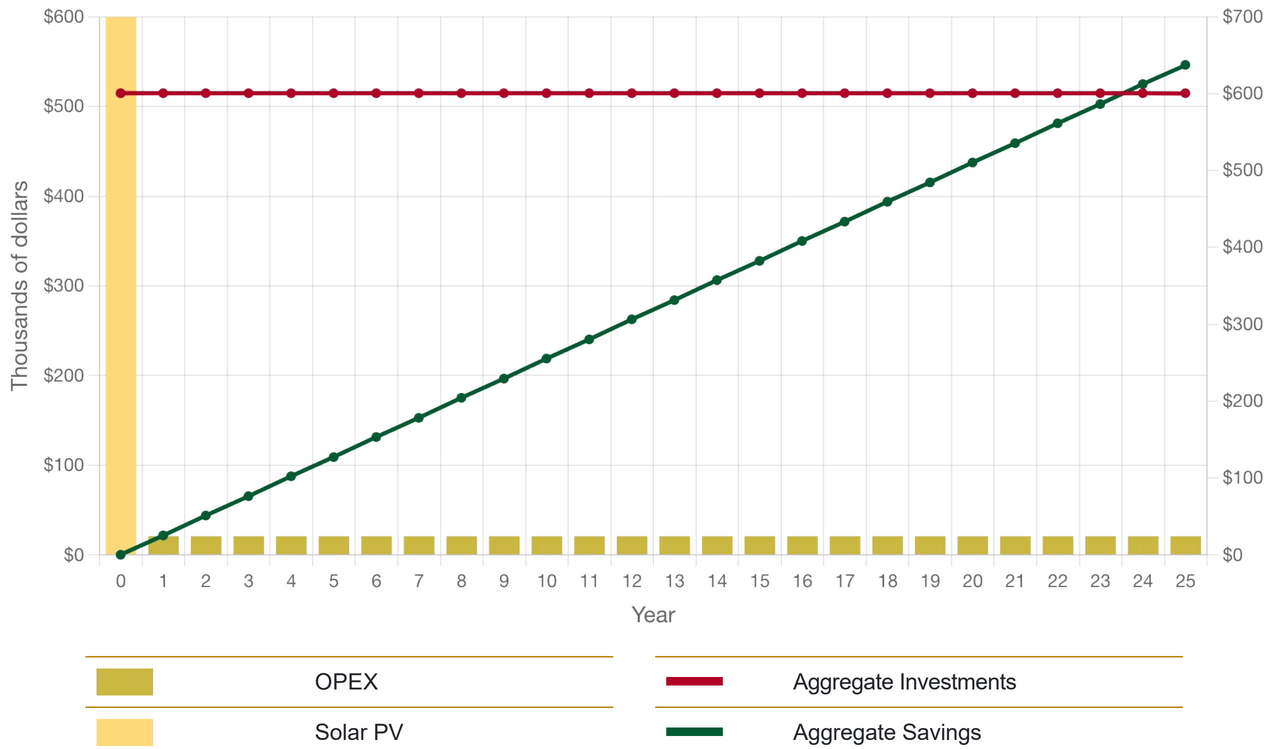


Annualized Energy Costs



	Reference	$47
	Optimized - Total	$52
	OPEX	$21
	Annualized Investment Costs	$30

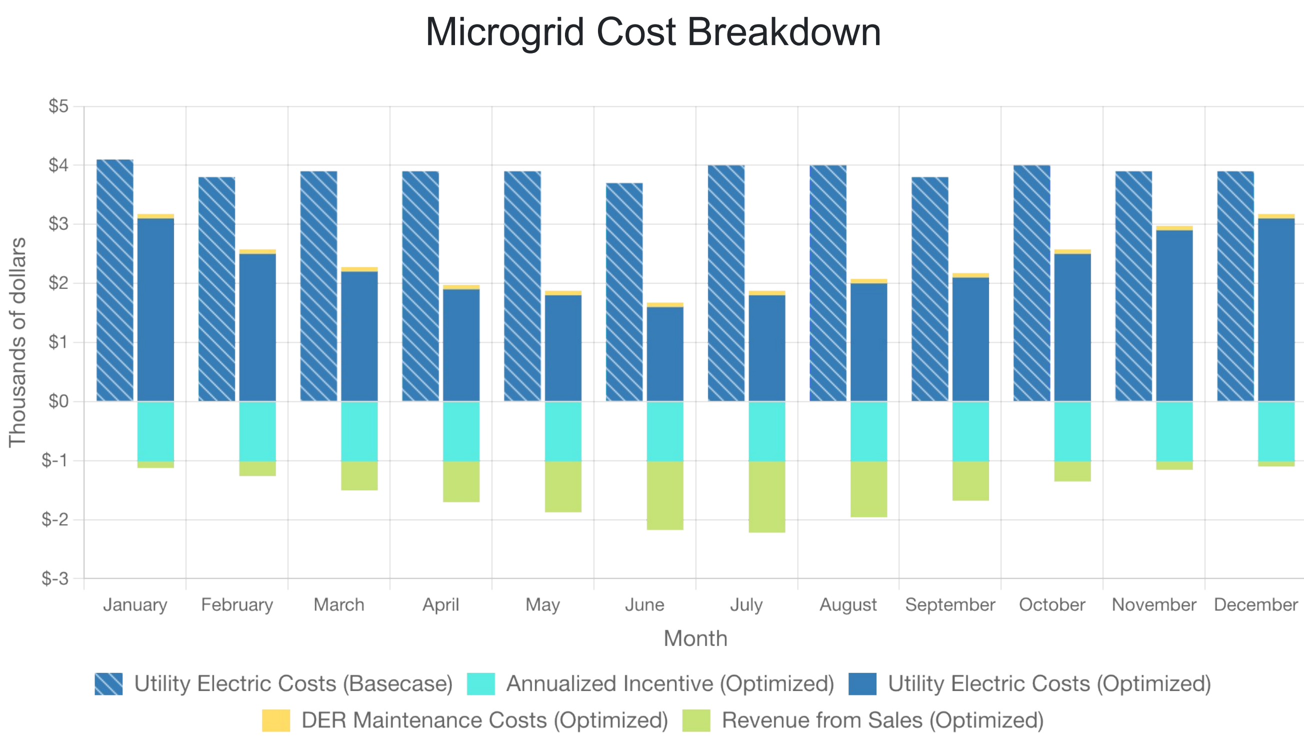
Costs and Savings Projection (Non-Discounted)

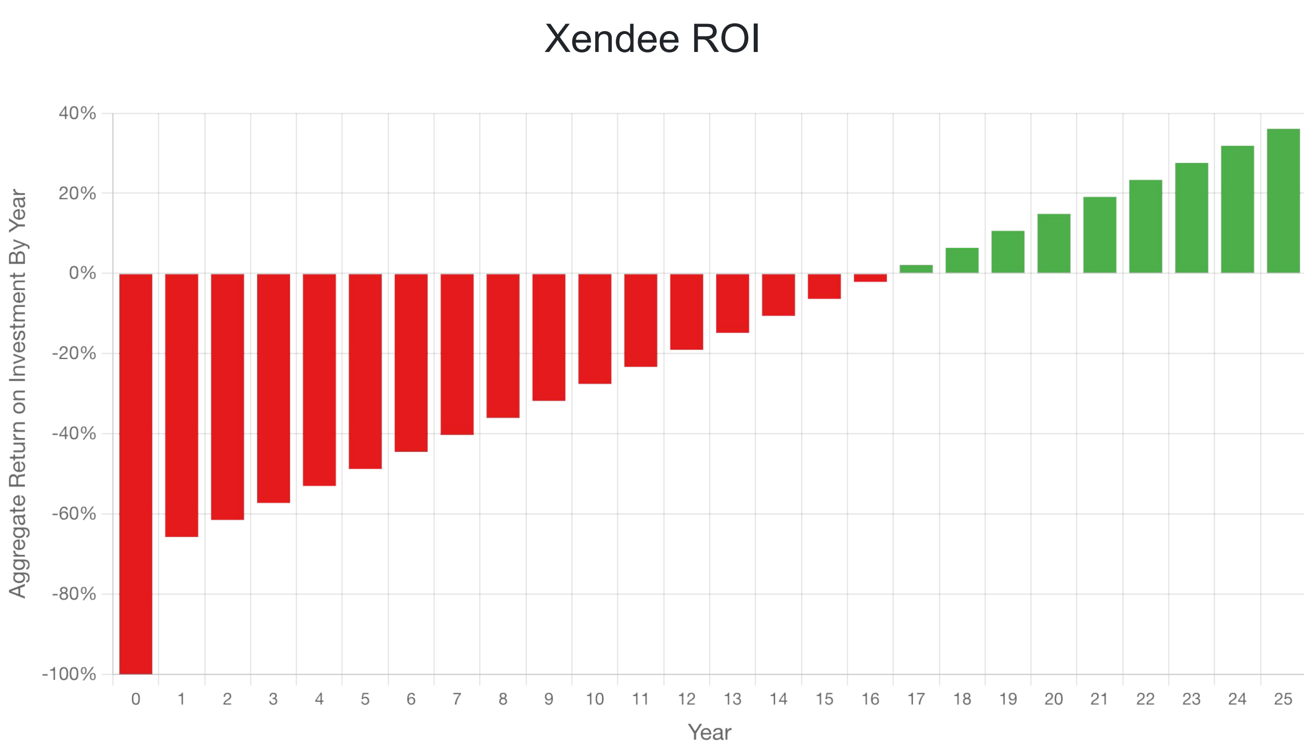


This is a non-discounted projection of the project costs and savings that assumes no changes in operation over time. Use the multi-year optimization feature to examine changes in investment and savings over time.

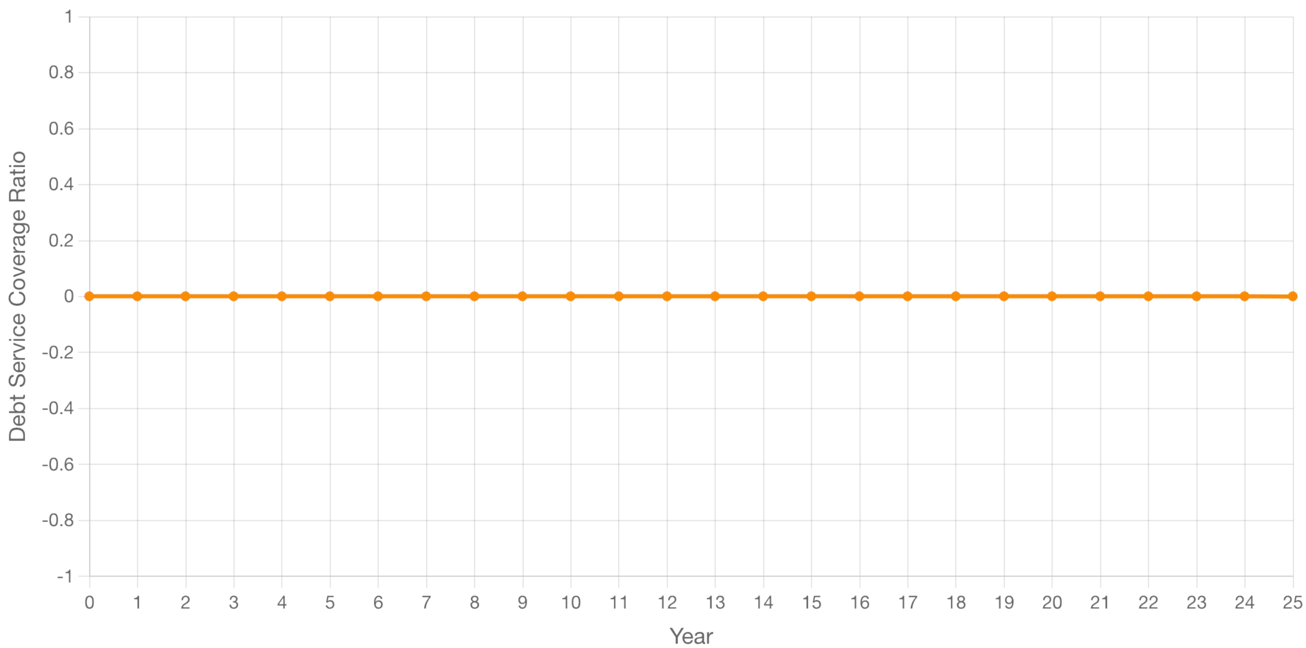
Financial Data

Primary financial indicators are provided in this section to facilitate assessing project returns. Return on investment (ROI), Net Present Value (NPV), and Internal Rate of Return (IRR) are calculated and graphed for each year leading out to twenty years from project implementation, providing insight on returns at different timelines. Also included is a detailed cash flow table.





Debt Service Coverage Ratio



Detailed Cash Flow: Cost

(thousands of dollars)

The cost cashflow table below displays the **costs to run the system,** not relative to any reference. The lines shown are the costs that the solution is subject to. A positive value is a revenue while a negative is a cost. The sum of the individual cost terms is used to calculate the system **net present costs.**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Electricity Sales	0	7	7	7	7	7
Utility Demand Charges	0	-7	-7	-7	-7	-7
Utility Energy Charges	0	-19	-19	-19	-19	-19
Utility Contract Costs	0	-2	-2	-2	-2	-2
DER Maintenance Costs	0	-1	-1	-1	-1	-1
Total OPEX Costs	0	-21	-21	-21	-21	-21
CAPEX for Solar PV	-600	0	0	0	0	0
Total CAPEX costs	-600	0	0	0	0	0
Federal ITC Credit	0	180	0	0	0	0
Total Incentives	0	180	0	0	0	0
Net Annual Cost (*Non-discounted*)	-600	159	-21	-21	-21	-21
Net Annual Cost (*Discounted*)	-600	151	-19	-19	-18	-17
Net Present Cost	**-600**	**-449**	**-469**	**-487**	**-505**	**-522**
Cumulative Cost (*Non-discounted*)	**-600**	**-442**	**-463**	**-485**	**-506**	**-528**
Cumulative Cost (*Discounted*)	**-600**	**-421**	**-420**	**-419**	**-416**	**-413**

	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Electricity Sales	7	7	7	7	7	7
Utility Demand Charges	-7	-7	-7	-7	-7	-7
Utility Energy Charges	-19	-19	-19	-19	-19	-19
Utility Contract Costs	-2	-2	-2	-2	-2	-2
DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Costs	-21	-21	-21	-21	-21	-21
CAPEX for Solar PV	0	0	0	0	0	0
Total CAPEX costs	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives	0	0	0	0	0	0
Net Annual Cost (*Non-discounted*)	-21	-21	-21	-21	-21	-21
Net Annual Cost (*Discounted*)	-16	-15	-15	-14	-13	-13
Net Present Cost	**-538**	**-553**	**-568**	**-582**	**-595**	**-607**
Cumulative Cost (*Non-discounted*)	**-549**	**-571**	**-592**	**-614**	**-635**	**-657**
Cumulative Cost (*Discounted*)	**-410**	**-406**	**-401**	**-396**	**-390**	**-384**

	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Electricity Sales	7	7	7	7	7	7
Utility Demand Charges	-7	-7	-7	-7	-7	-7
Utility Energy Charges	-19	-19	-19	-19	-19	-19
Utility Contract Costs	-2	-2	-2	-2	-2	-2
DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Costs	-21	-21	-21	-21	-21	-21
CAPEX for Solar PV	0	0	0	0	0	0
Total CAPEX costs	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives	0	0	0	0	0	0
Net Annual Cost (*Non-discounted*)	-21	-21	-21	-21	-21	-21
Net Annual Cost (*Discounted*)	-12	-11	-11	-10	-10	-9
Net Present Cost	**-619**	**-631**	**-642**	**-652**	**-662**	**-671**
Cumulative Cost (*Non-discounted*)	**-678**	**-700**	**-721**	**-743**	**-764**	**-786**
Cumulative Cost (*Discounted*)	**-378**	**-371**	**-364**	**-357**	**-350**	**-343**

	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23
Electricity Sales	7	7	7	7	7	7
Utility Demand Charges	-7	-7	-7	-7	-7	-7
Utility Energy Charges	-19	-19	-19	-19	-19	-19
Utility Contract Costs	-2	-2	-2	-2	-2	-2
DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Costs	-21	-21	-21	-21	-21	-21
CAPEX for Solar PV	0	0	0	0	0	0
Total CAPEX costs	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives	0	0	0	0	0	0
Net Annual Cost (*Non-discounted*)	-21	-21	-21	-21	-21	-21
Net Annual Cost (*Discounted*)	-9	-9	-8	-8	-7	-7
Net Present Cost	**-680**	**-689**	**-697**	**-704**	**-712**	**-719**
Cumulative Cost (*Non-discounted*)	**-807**	**-829**	**-850**	**-871**	**-893**	**-914**
Cumulative Cost (*Discounted*)	**-335**	**-328**	**-320**	**-313**	**-305**	**-298**

	Year 24	Year 25
Electricity Sales	7	7
Utility Demand Charges	-7	-7
Utility Energy Charges	-19	-19
Utility Contract Costs	-2	-2
DER Maintenance Costs	-1	-1
Total OPEX Costs	-21	-21
CAPEX for Solar PV	0	0
Total CAPEX costs	0	0
Federal ITC Credit	0	0
Total Incentives	0	0
Net Annual Cost (*Non-discounted*)	-21	-21
Net Annual Cost (*Discounted*)	-7	-6
Net Present Cost	**-725**	**-732**
Cumulative Cost (*Non-discounted*)	**-936**	**-957**
Cumulative Cost (*Discounted*)	**-290**	**-283**

Detailed Cash Flow: Savings

(thousands of dollars)

The Savings cashflow table below displays the **savings the system produces relative to the reference.** The lines shown are the savings that the solution creates. A positive value is a savings while a negative is a loss. The sum of the individual savings terms is used to calculate the system **net present value** of the system.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue Increase: Electricity Sales	0	7	7	7	7	7
Savings: Utility Demand Charges	0	2	2	2	2	2
Savings: Utility Energy Charges	0	18	18	18	18	18
Savings: DER Maintenance Costs	0	-1	-1	-1	-1	-1
Total OPEX Savings	0	26	26	26	26	26
CAPEX difference for Solar PV	-600	0	0	0	0	0
Total CAPEX Difference	-600	0	0	0	0	0
Federal ITC Credit	0	180	0	0	0	0
Total Incentives Difference	0	180	0	0	0	0
Net Annual Cash Flow (*Non-discounted*)	-600	206	26	26	26	26
Net Annual Cash Flow (*Discounted*)	-600	196	23	22	21	20
Net Present Value	**-600**	**-405**	**-382**	**-359**	**-339**	**-319**
Cumulative Cash Flow (*Non-discounted*)	**0**	**-395**	**-369**	**-344**	**-318**	**-293**
Cumulative Cash Flow (*Discounted*)	**0**	**-376**	**-335**	**-297**	**-262**	**-229**

	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Revenue Increase: Electricity Sales	7	7	7	7	7	7
Savings: Utility Demand Charges	2	2	2	2	2	2
Savings: Utility Energy Charges	18	18	18	18	18	18
Savings: DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Savings	26	26	26	26	26	26
CAPEX difference for Solar PV	0	0	0	0	0	0
Total CAPEX Difference	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives Difference	0	0	0	0	0	0
Net Annual Cash Flow (*Non-discounted*)	26	26	26	26	26	26
Net Annual Cash Flow (*Discounted*)	19	18	17	16	16	15
Net Present Value	**-300**	**-281**	**-264**	**-248**	**-232**	**-217**
Cumulative Cash Flow (*Non-discounted*)	**-267**	**-242**	**-216**	**-191**	**-165**	**-140**
Cumulative Cash Flow (*Discounted*)	**-200**	**-172**	**-146**	**-123**	**-102**	**-82**

	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Revenue Increase: Electricity Sales	7	7	7	7	7	7
Savings: Utility Demand Charges	2	2	2	2	2	2
Savings: Utility Energy Charges	18	18	18	18	18	18
Savings: DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Savings	26	26	26	26	26	26
CAPEX difference for Solar PV	0	0	0	0	0	0
Total CAPEX Difference	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives Difference	0	0	0	0	0	0
Net Annual Cash Flow (*Non-discounted*)	26	26	26	26	26	26
Net Annual Cash Flow (*Discounted*)	14	14	13	12	12	11
Net Present Value	**-203**	**-190**	**-177**	**-164**	**-153**	**-142**
Cumulative Cash Flow (*Non-discounted*)	**-115**	**-89**	**-64**	**-38**	**-13**	**13**
Cumulative Cash Flow (*Discounted*)	**-64**	**-47**	**-32**	**-18**	**-6**	**6**

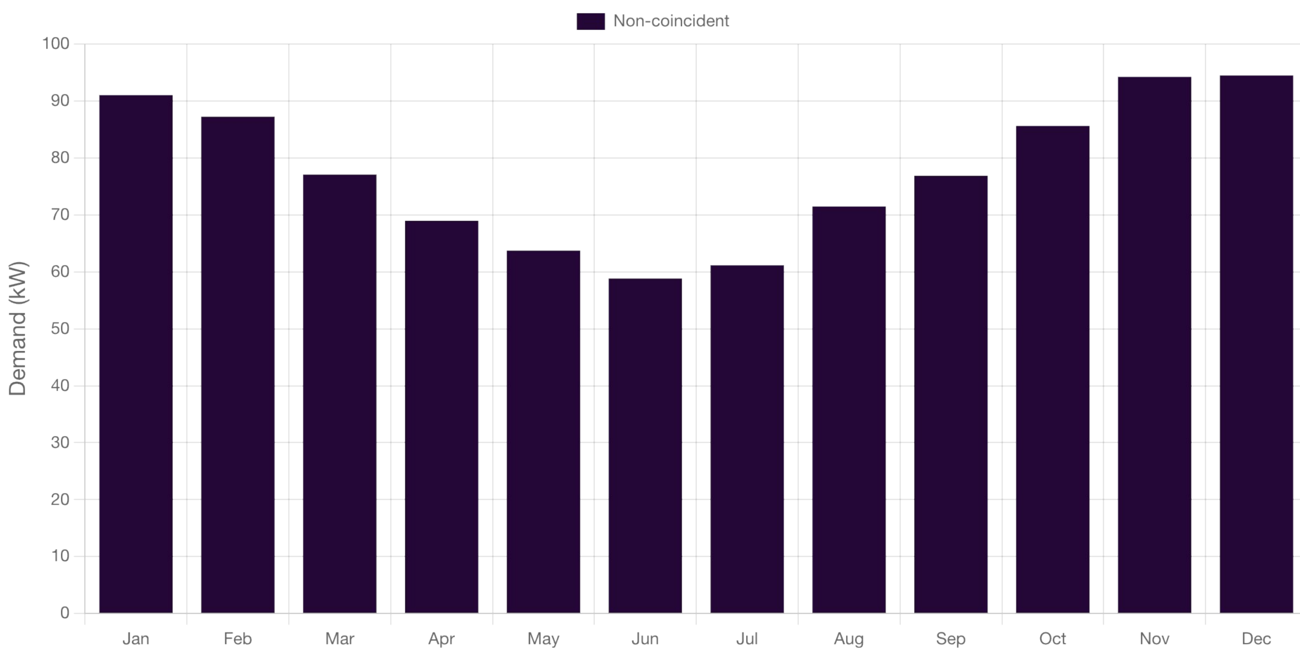
	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23
Revenue Increase: Electricity Sales	7	7	7	7	7	7
Savings: Utility Demand Charges	2	2	2	2	2	2
Savings: Utility Energy Charges	18	18	18	18	18	18
Savings: DER Maintenance Costs	-1	-1	-1	-1	-1	-1
Total OPEX Savings	26	26	26	26	26	26
CAPEX difference for Solar PV	0	0	0	0	0	0
Total CAPEX Difference	0	0	0	0	0	0
Federal ITC Credit	0	0	0	0	0	0
Total Incentives Difference	0	0	0	0	0	0
Net Annual Cash Flow (*Non-discounted*)	26	26	26	26	26	26
Net Annual Cash Flow (*Discounted*)	11	10	10	9	9	8
Net Present Value	**-131**	**-121**	**-111**	**-102**	**-93**	**-85**
Cumulative Cash Flow (*Non-discounted*)	**38**	**64**	**89**	**115**	**140**	**166**
Cumulative Cash Flow (*Discounted*)	**16**	**25**	**34**	**41**	**48**	**54**

	Year 24	Year 25
Revenue Increase: Electricity Sales	7	7
Savings: Utility Demand Charges	2	2
Savings: Utility Energy Charges	18	18
Savings: DER Maintenance Costs	-1	-1
Total OPEX Savings	26	26
CAPEX difference for Solar PV	0	0
Total CAPEX Difference	0	0
Federal ITC Credit	0	0
Total Incentives Difference	0	0
Net Annual Cash Flow (*Non-discounted*)	26	26
Net Annual Cash Flow (*Discounted*)	8	8
Net Present Value	**-77**	**-70**
Cumulative Cash Flow (*Non-discounted*)	**191**	**217**
Cumulative Cash Flow (*Discounted*)	**59**	**64**

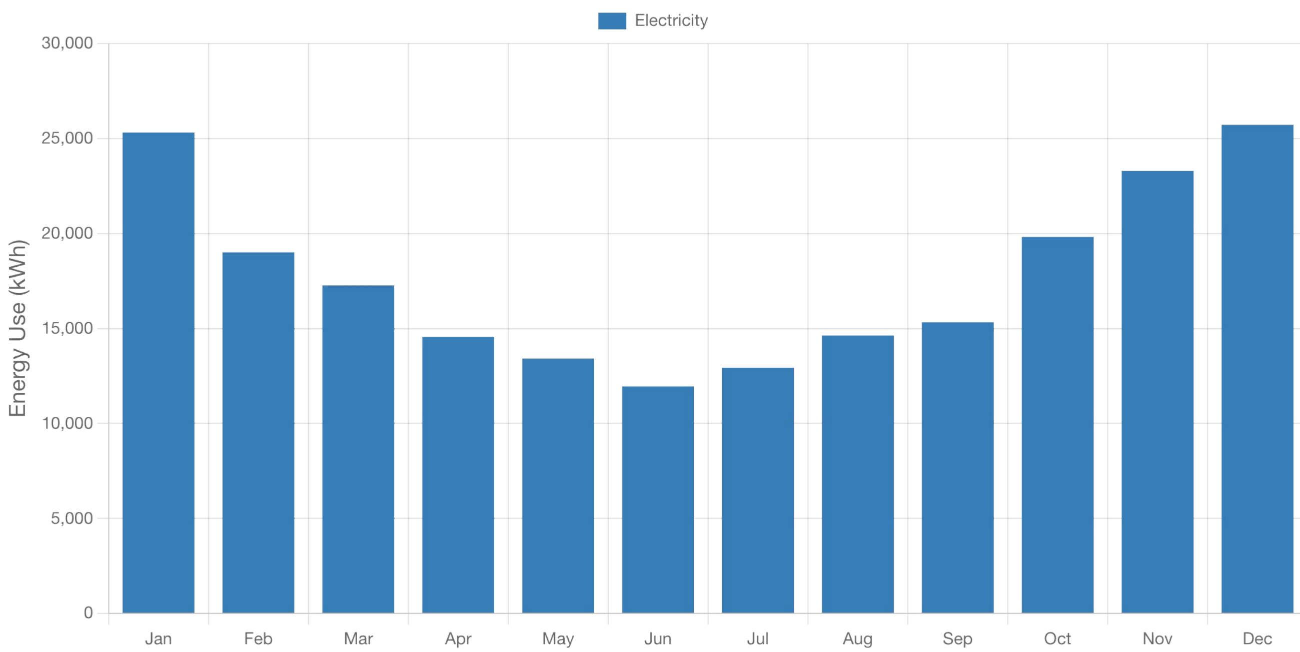
Utility Data

This section provides a summary of electricity and fuel utility purchases. Monthly breakdowns of energy consumption [kWh], demand by time-of-use period [kW], and total charges [k$] are included.

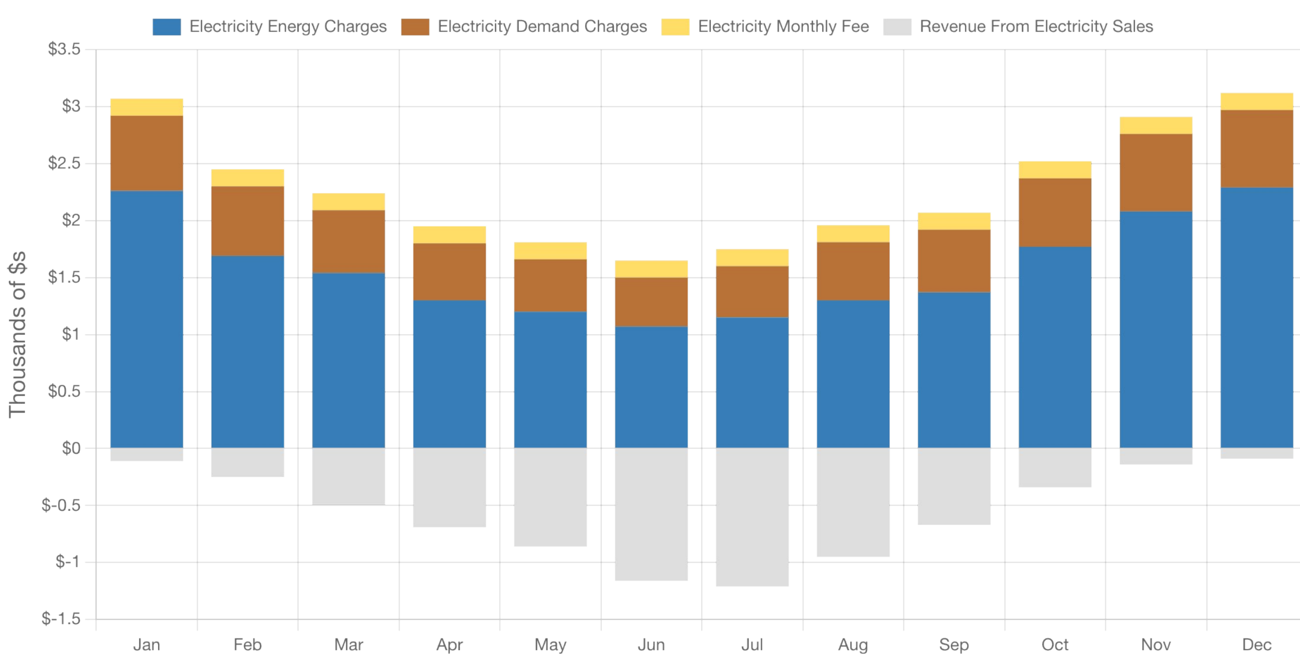
Monthly Demand (kW)



Monthly Energy Consumption (kWh)



Monthly Utility Charge Breakdown



Utility Billing Period

Billing for Annual

Annual Summary of Charges

Electricity Energy Charges [$]	12,056.77
Electricity Demand Charges [$]	6,671.20
Electricity Monthly Fee [$]	1,836.52
Total [$]	20,564.49
Reference [$]	46,967.05
Savings [$]	26,402.56

Annual Fuel Charges

Fuel Category	Consumption [kWh]	Rate [$/kWh]	Fuel Charge [$]
Fuel Subtotal [$]			0.00
Reference [$]			0.00
Savings [$]			0.00

Annual Electricity Charges

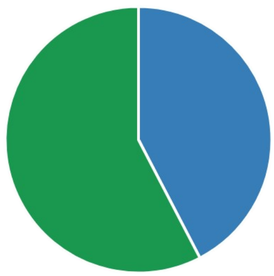
Tariff	Energy Category	Consumption [kWh]	Rate [$/kWh]	Energy Charge [$]
28	PTOU1 - tier1	213,295.54	-	19,015.30
28	Exports	88,790.75	-	-6,958.53
Energy Subtotal [$]				12,056.77
Reference [$]				36,963.18
Savings [$]				24,906.41

Tariff	Demand Category	Demand [kW]	Rate [$/kW]	Demand Charge [$]
28	noncoincident - tier1	50.00	-	4,500.00
28	noncoincident - tier2	44.48	-	895.17
28	noncoincident - tier3	0.00	-	0.00
28	noncoincident - tier4	37.24	-	1,276.03
Demand Subtotal [$]				6,671.20
Reference [$]				8,167.35
Savings [$]				1,496.15

Energy Balance and Technology Investments

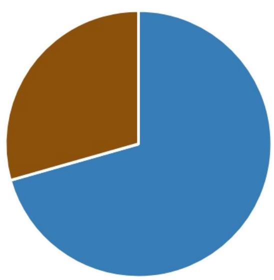
This section provides data on system energy demand and portfolio technologies. Included are details on total annual demand for each end-use modeled, share of demand met by utility purchases and on-site DER assets, total capacities of existing and new DER assets, and upfront investment costs.

Annual Electricity Balance (kWh)



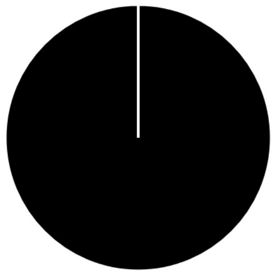
	Total annual electricity purchase (kWh)	213,296
	Total annual on-site generation from renewables (kWh)	290,113
	Total	**503,409**

Utility Balance (kWh)



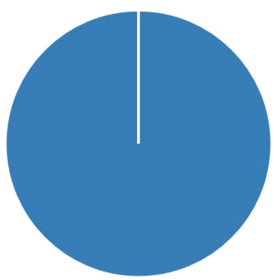
	Total annual electricity purchase (kWh)	213,296
	Total annual electricity exports (kWh)	88,791

Aggregated Demand (kWh)



	Electricity-Only Demand	414,618

CO_2 Emissions (metric tons)



	Electricity	126
	Total	**126**

Generation Technologies (kWh)

	New Solar PV (kWdc)	192
	Total	**192**

Tech	Used / Available Space (ft^2)	%
Solar PV	10,849 / 50,214	21.60%

Tech	Capacity Factor
Solar PV	17.29%

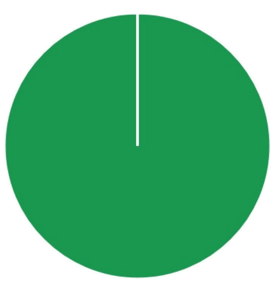
Investments

	New Solar PV	$600,438
	Total	**$600,438**

Annual PV Electricity Balance (kWh)

	Electricity Consumed On-site	201,322
	Electricity Exported	88,791
	Total	**290,113**

CAPEX Breakdown ($)

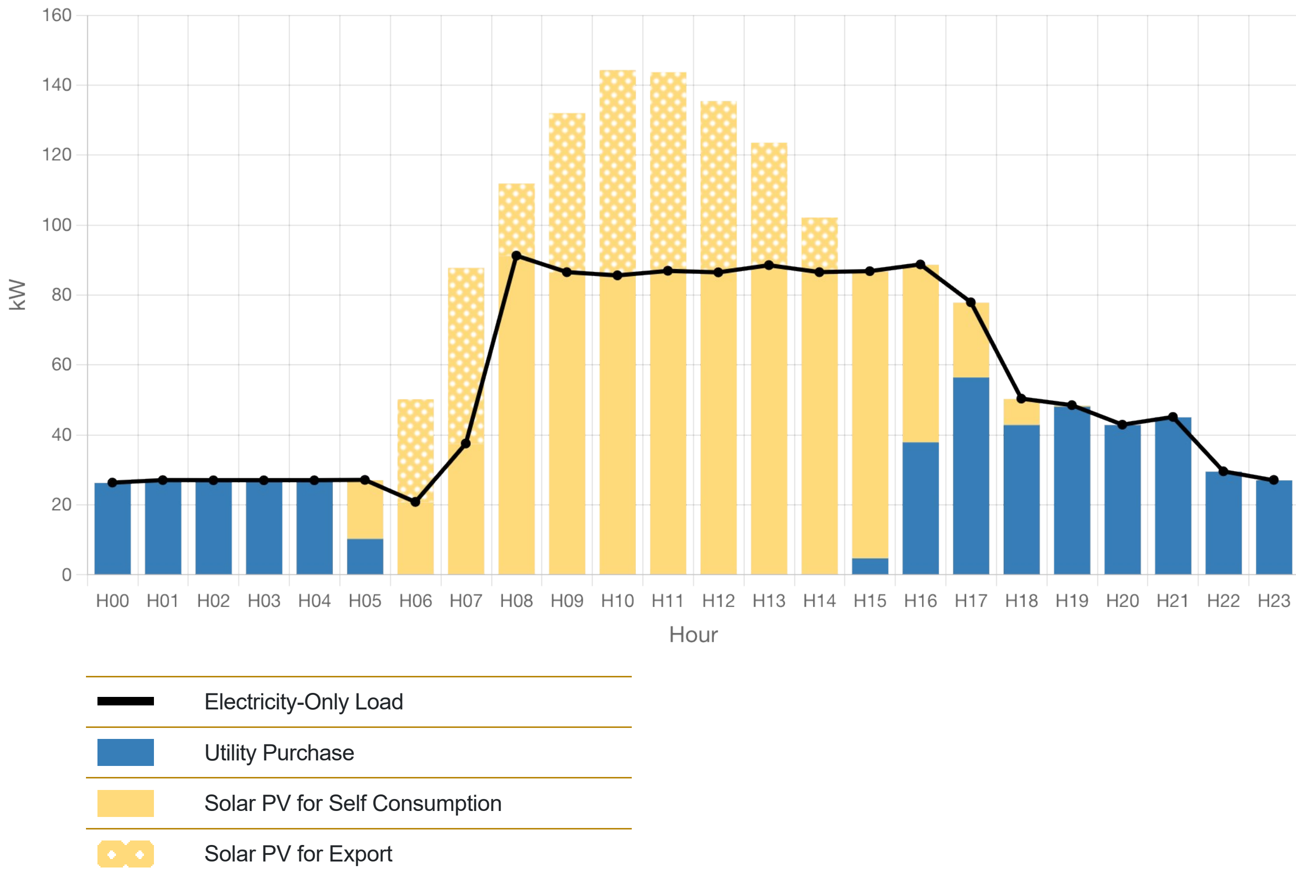


	Total Paid Upfront	$600,438
	Total	**$600,438**

Electricity Dispatch

The following dispatch curves show the optimal system operation to meet all electricity loads on a selection of modeled days. Electricity dispatch shows both the electricity-only loads and any electricity used to operate cooling and/or refrigeration technologies. System operation includes on-site generation and storage dispatch, utility purchases, and load management strategies.

Electricity Dispatch for July, Week

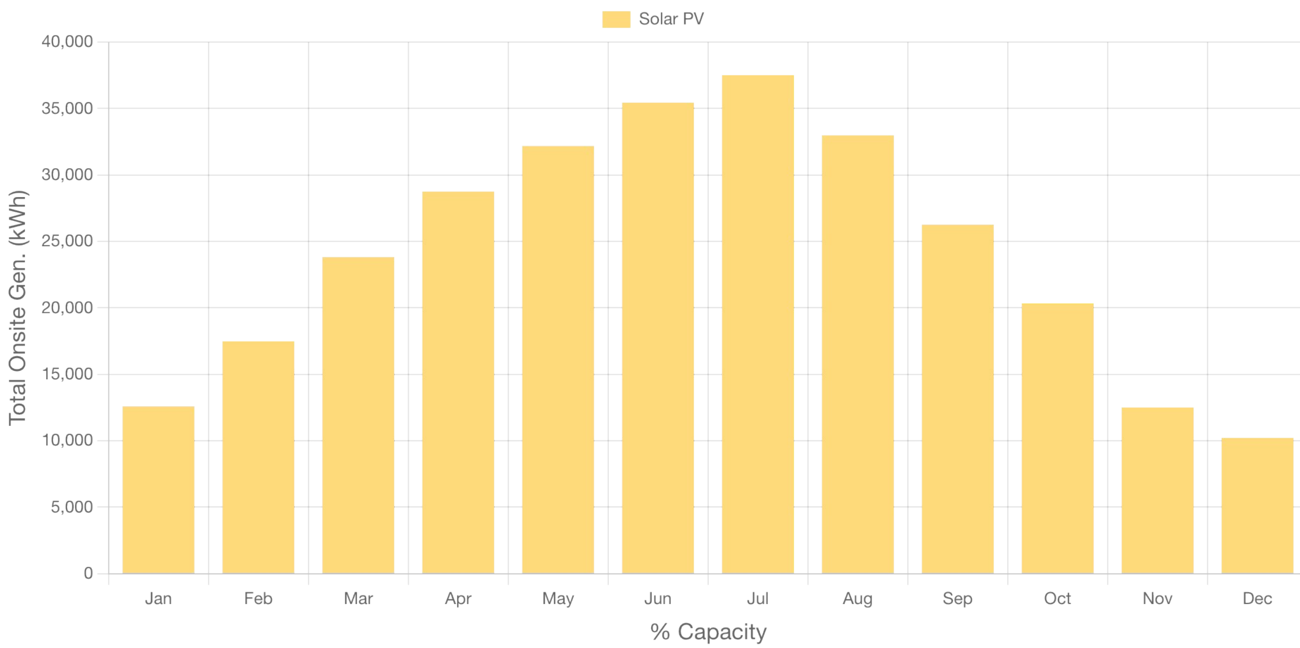


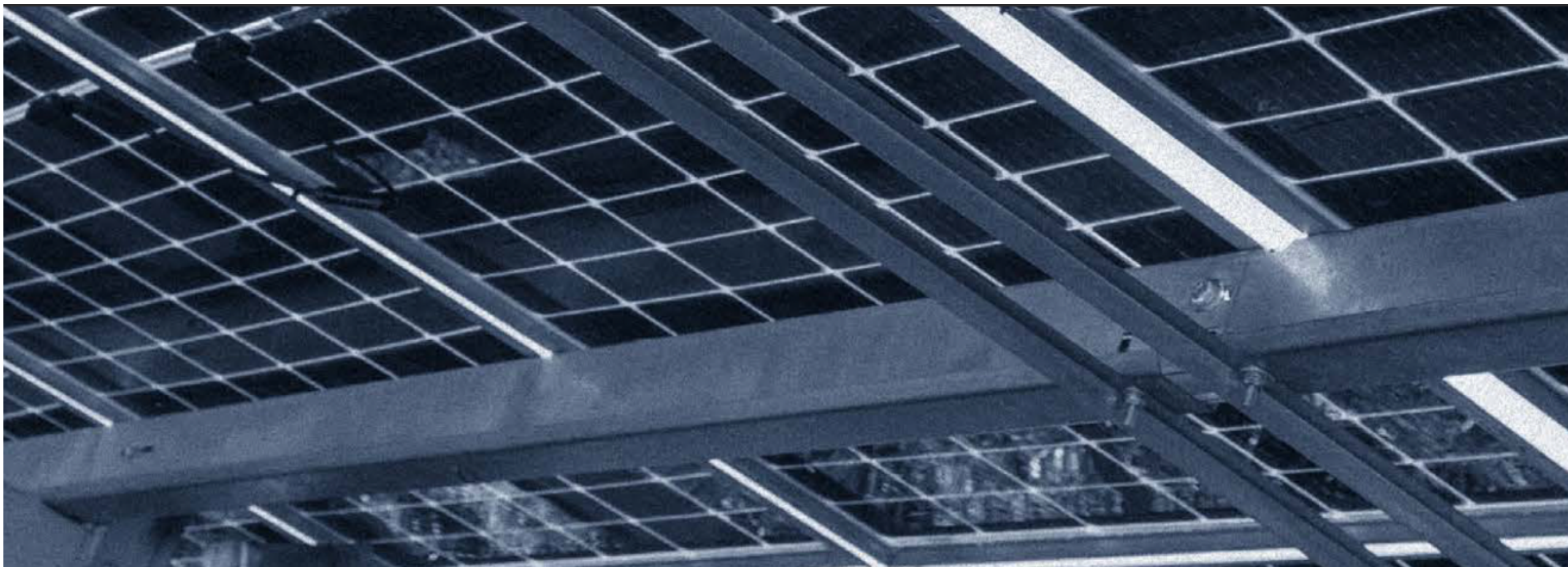
* Axes NOT Scaled on Dispatch Graph By Data Across All Months / Day Types

Operation Summary

This section provides a summary of generator operation and monthly on-site generation.

Monthly On-Site Generation (kWh)





APPENDIX F:
RFP System Description & Needs

Solar PV System Minimum Equipment and Construction Requirements

General

1. Provide and install a rooftop Photovoltaic (PV) energy generation system for Deschutes County (Buyer) at the *Deschutes County Fairgrounds Conference Center*, located at *3800 SW Airport Way, Redmond, OR 97756.*
2. All power generation and transmission equipment must be UL listed for its designed use.
3. Construction must comply with current adopted 2021 Oregon Electrical Specialty Code and 2022 Oregon Structural Specialty Code, which encompasses:
    a. 2021 International Building Code (IBC) and International Existing Building Code (IEBC)
    b. 2020 National Electric Code (NEC)
    c. All other relevant state and national codes
4. There must be a minimum 10-year warranty for all materials and workmanship.
5. System integrator is responsible for conducting all required building, utility, and rebate inspections; system integrator must complete all construction and documentation in a manner necessary to pass such inspections, and the work must be conducted in accordance with industry standard best practices.
6. System integrator must possess a current state electrical or limited renewable energy contractor license from the Oregon Construction Contractors Board to perform the work being proposed.
7. This work is anticipated to begin _________ and be completed by ________

Solar PV Modules

1. System modules shall be UL61730 listed and CEC-listed.
2. System modules must have a 10-year warranty on a minimum of 90% nameplate energy production and 25-year warranty on a minimum of 80% nameplate energy production.
3. All warranties must be documented in advance and be fully transferable to Buyer.
4. The PV system should provide up to 200 kWDC using below specified module equipment (or approved equivalent):
    a. BNEF Tier 1 and UL Listed
    b. Minimum efficiency: 20%
    c. Minimum wattage: 450WDC STC
5. In order to allow flexibly increasing the contracted PV system size during design phase, bidders should include a dollar-per-Watt ($/W) add-on price for additional installed generation capacity beyond their proposed system size; this add-on price should take into consideration site conditions, available space, electrical compatibility of equipment, and other pertinent factors.

Racking

1. Racking components shall be UL2703 listed and electrically and structurally compatible with the selected PV system modules and the roofing material to which they will attach or rest upon.
2. Racking components shall be produced by one of the following specified manufacturers, or an approved alternative:
    a. Unirac
    b. IronRidge

Inverter

3. Inverters shall be UL1741 and CEC-listed with an efficiency of 95% or higher
4. Inverters must carry a minimum 10-year warranty.
5. All warranties must be documented in advance, and be fully transferable to Buyer.
6. Inverters must be from one of the following specified manufacturers, or approved equivalent:
    a. SolarEdge
    b. Solectria
    c. Chint Power Systems

Balance of System Equipment

1. The PV system shall include, at a minimum, one fused DC disconnect and one fused AC disconnect for safety and maintenance concerns.
2. String combiner boxes must include properly-sized fusing, and all metal equipment and components must be bonded and grounded as required by 2021 Oregon Electrical Specialty Code.
3. All system wiring and conduit must comply with applicable local code and NEC stipulations.
4. Wall penetrations must be sealed in compliance with NEC and National Fire Protection Association (NFPA) regulations.
5. All wiring materials and methods must adhere to industry-standard best practices.
6. Material requirements:
    a. Fasteners and hardware throughout the system shall be stainless steel or material of equivalent corrosion resistance.
    b. Racking components shall be anodized aluminum, hot-dipped galvanized steel, or material of equivalent corrosion resistance.
    c. Unprotected steel not to be used in any components.

Interconnection

1. System interconnection must comply with 2021 Oregon Electrical Specialty Code and Utility regulations and must be approved by the local Utility and the Authority Having Jurisdiction (AHJ)'s Building Department before any PV system construction is begun.
2. The interconnection point shall be a supply-side connection, unless the System Integrator is able to demonstrate AHJ approval of a load-side connection.
3. Supply-side connection(s) shall be made between the CT meter and main switchgear overcurrent protection device.
4. All placards required by Buyer, the AHJ, the Utility, and/or state solar initiative program must be provided and installed according to Buyer and 2021 Oregon Electrical Specialty Code guidelines.

Monitoring and Reporting Systems

1. System must include real-time PV production monitoring provided to Buyer at no additional annual subscription cost.
2. Proposals must include internet hosting of monitoring with online access for Buyer personnel and touchscreen kiosk or video monitor for public display of data; furnishing and installation of kiosk or display equipment is Buyer's responsibility, and shall not be included in proposals.
3. System integrator must work with the Buyer to determine the best location and technique for monitoring communications interconnection.

4. System integrator will be responsible for providing all required monitoring communications and power wiring and conduit, with Buyer guidance on approved locations.

System Design and Permitting

1. For each site, within 90 days of contract being signed, Respondent shall create a construction plan set which includes at a minimum:
    a. Site overview
    b. Detailed array layout with stringing configuration
    c. Mounting and racking details
    d. Details of electrical conduit routing and location of electrical enclosures; conduit support details; and enclosure mounting details
    e. Electrical single-line diagram
    f. Monitoring plan
    g. Construction project plan with timeline
2. All proposed system designs and construction techniques must be approved by the AHJ.
3. A building permit is required for each system and must be obtained through normal permitting processes by Respondent.
4. Respondent shall obtain structural PE stamp verifying the integrity of the existing facility to handle additional weight load of proposed PV system.
5. Respondent shall obtain electrical PE stamp verifying the integrity and code compliance of proposed PV system and interconnection with facility.
6. Roof-mounted array layouts shall be designed to provide adequate setback distances between the array boundary and the roof edge, as required by 2021 Oregon Electrical Specialty Code and the AHJ; system layout must allow convenient access to existing roof HVAC equipment and vents.
7. Final array layouts shall be designed to avoid shading from 9am to 3pm annually. If this shading requirement cannot be strictly met, Respondent shall specify the predicted solar availability (TSRF) and performance losses. TSRF at all locations of the array must exceed 80%.
8. Wire loss in DC circuits to be < 1.5%.
9. Wire loss in AC circuits to be < 1.5%.

Construction

1. Integrator shall prepare, maintain, and abide by a Site Safety Plan to include, at a minimum, all applicable Occupational Safety and Health Administration (OSHA) workplace safety and Personal Protective Equipment (PPE) requirements.
2. Construction work shall be designed to minimize impact to facility operations. Integrator shall develop a construction plan for site access, staging, and equipment storage and obtain approval from the Buyer prior to beginning construction.
3. All asphalt, concrete, landscaping, and other areas that are disturbed during construction shall be remediated and returned to original condition, or equivalent condition as approved by the Buyer.
4. After completion of work, site shall be left clean and free of any dirt or debris that may have accumulated during construction. All construction equipment, spoils, and other construction byproducts shall be removed from the site.
5. All electrical enclosures and equipment shall be installed to be readily accessible to qualified personnel only.

6. All visible conduits and electrical equipment shall be painted or aesthetically dressed per Buyer specifications, as allowable by equipment manufacturer guidelines.
7. Location of existing underground utilities must be marked by USA/Dig Alert or equivalent private service prior to any underground work.

Documentation and Process Control

In addition to construction requirements listed above, system integrator will be required to:

1. Apply for and receive interconnection approval from the local Utility for proposed PV systems.
2. Obtain Solar rebates and/or Renewable Energy Credits (if applicable).
3. Provide Operations & Maintenance training to Buyer staff and prepare press releases and a ribbon-cutting ceremony at Buyer request.
4. Provide an add-on for 20 years of system maintenance (at Buyer's sole discretion, priced separately), with annual reports of system performance and consistent oversight of system monitoring.
    a. Respondent shall be required to respond to system downtime within 48 hours of first occurrence of incidence. If corrective action is not immediately feasible, Respondent shall notify Buyer of action plan and timeline for execution.
    b. Respondent shall be required to respond to warranty related issues not affecting production within 5 days of notification.
5. Provide As-Built drawings of PV system, which must include finalized module layout and stringing chart.