AMENDMENT No. 3 TO MASTER ENERGY PERFORMANCE CONTRACT

THIS ENERGY PERFORMANCE CONTRACT AGREEMENT AMENDMENT NO. 3 is made and entered into this _____ day of December, 2025, by and between the **CITY OF MISSOULA, MONTANA,** a municipal corporation organized and existing under the laws of the State of Montana, 435 Ryman, Missoula, Montana 59802, hereinafter referred to as "CLIENT", and **McKinstry Essention, LLC**, 5005 3rd Avenue South, Seattle, WA 98134, hereinafter referred to as "CONTRACTOR""

Recitals

1. On December 21, 2022 the above parties entered into a Master Energy Performance Contract ("Contract") whereby the CONTRACTOR agreed to perform work and provide the services in accordance with the requirements of the Contract and Appendix A – General Conditions of the Contract for Construction.

2. The parties amended the Contract in order to include additional work, as described in Contract Amendments No. 1 for Two Million, Six Hundred Eighty Thousand, Nine Hundred Fifty-Six Dollars ($2,680,956) and No. 2 for One Million, Nine Hundred Eighty-Five Thousand, Five Hundred Fifty-Three Dollars ($1,985,553) bringing the total contract value to Four Million, Six Hundred Sixty-Six Thousand, Five Hundred Nine Dollars ($4,666,509).

3. The parties subsequently executed change orders COP 001 – 004 which sum to a net deduction of Sixteen Thousand, Six Hundred Seventy-Six Dollars and Fifty-Six Cents ($16,676.56) bringing the total contract value to Four Million, Six Hundred Forty-Nine Thousand, Eight Hundred Thirty-Two Dollars and Forty-Four cents ($4,649,832.44).

4. The CLIENT and CONTRACTOR now desire to amend the Contract as set forth below in order to include additional work, as described in the attached Exhibit I. The work to be completed under this Amendment No. 3 shall cost Seven Hundred Eighty-Six Thousand, Nine Hundred Ninety-Five Dollars ($786,995) bringing the total contract value to Five Million, Four Hundred Thirty-Six Thousand, Eight Hundred Twenty-Seven Dollars and Forty-Four cents ($5,436,827.44).

5. Provisions of the original contract dated December 21, 2022, that are not amended herein remain in full force and effect.

Amendment

In consideration of the mutual covenants and agreements herein contained, the receipt and sufficiency whereof being hereby acknowledged, the parties hereto agree to amend the Agreement as follows:

1. Scope of Work/Task Deadlines, described in Exhibit I to the contract, is amended to incorporate the following Scope of Services attached hereto.

2. Payment, is amended to a total amount of Five Million, Four Hundred Thirty-Six Thousand, Eight Hundred Twenty-Seven Dollars and Forty-Four cents ($5,436,827.44) for services performed pursuant to the Scope of Services.

IN WITNESS WHEREOF, the parties hereto have executed this instrument the day and year first above written.

CONTRACTOR:
McKinstry Essention, LLC

_____
Dale Silha, Sr VP Pacific NW Region

CLIENT:
City of Missoula, Montana

_____
Andrea Davis, Mayor

ATTEST:

_____
Claire Trimble, City Clerk

APPROVED AS TO FORM AND CONTENT:

_____
Ryan Sudbury, City Attorney

(SEAL)

City of Missoula

Exhibit I: Preliminary Investment Grade Audit Report
WWTP Side 2 Solar PV

December 3, 2025

FOR THE LIFE OF YOUR BUILDING

December 3, 2025

Logan McInnis – Deputy Director of Utilities
City of Missoula
435 Ryman St
Missoula, MT 59802

Subject: City of Missoula Preliminary Investment Grade Audit Report

McKinstry is honored to present this preliminary Investment Grade Audit Report (IGAR) for the City of Missoula. The intent of the IGAR was to investigate a behind-the-meter non-export solar PV array for side 2 of the city's wastewater treatment plant.

Per MCA 90-4-1113 and rule making by Montana DEQ, the final IGA report will by signed and stamped by a professional engineer registered in Montana after making any revisions resulting from review by DEQ and the City of Missoula.

I state that I am a licensed Professional Engineer in the State of Montana, and that I am the engineer of record for the City of Missoula IGAR dated December XX, 2025.

Printed Name and Title

State of Montana License Number

Signature

Date

McKinstry's team has completed an extensive and collaborative effort to evaluate the solar PV project at City of Missoula's wastewater treatment plant (Side 2) and we look forward to implementing this project and assisting with any future needs as the city continues to make progress towards achieving your ambitious Climate and Sustainability goals.

Thank You,

Matt Thompson, CEM, CEA

Project Director

Notice of Acceptance of Investment Grade Audit Report

Notice is hereby given that the City of Missoula accepts the McKinstry Investment Grade Audit Report (IGAR) dated December XX, 2025.

Entity Name: City of Missoula

Entity Representative:

Date:

ESCO Name: McKinstry

ESCO Representative:

Date:

When completely executed, this form can be scanned and emailed back.

Please email to mattth@mckinstry.com

Contents

Executive Summary

1.1 OVERVIEW

McKinstry Essention, Inc. (herein after as McKinstry) is pleased to present this proposal for the implementation of a solar PV array at the City of Missoula's wastewater treatment plant (Side 2).

This report follows the outline contained in Section 2 of the Energy Services Agreement. It presents the contractual terms under which McKinstry and the City of Missoula will work together over the term of the project. This Proposal describes the scope, costs, guarantees, and other aspects of the project.

1.2 PROJECT DESCRIPTION

This project includes installation of a 275 kW DC / 200 kW AC geoballast, ground mounted solar PV system interconnected to side 2 of the Missoula wastewater treatment plant.

1.3 SUMMARY OF BENEFITS

This project is anticipated to produce 351,428 kWh in its first year of operation saving the city $31,629 in utility purchased electricity and reducing over 171 metric tons CO2e, equivalent to the annual energy use of 23 homes or eliminating 189,949 pounds of coal from being burned.

Note: GHG reductions calculated using 2023 NWE emissions factor for owned generation and EPA GHG equivalencies calculator:
https://northwesternenergy.com/docs/default-source/default-document-library/about-us/esg/eei-esg-template.pdf

https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

1.4 MAXIMUM PROJECT COST

McKinstry guarantees that the project cost, related specifically to the project scope defined herein, will not exceed the maximum price of $786,995.

1.5 CONCLUSION

This project represents an excellent opportunity for the city of Missoula to invest in renewable energy, protecting the city from rising utility rates while also reducing GHG emissions in alignment with the city's ambitious Climate and Sustainability goals.

Scope of Work

2.1 Scope of Work

Procure and construct a 275 kW DC / 200 kW AC geoballast, ground mounted solar PV system interconnected to side 2 of the Missoula wastewater treatment plant, including:

- Solar equipment
    - (QTY 500) Aptos 550 W Solar Panels
    - (QTY 4) SMA Core1 50 kW Inverters (with extended 20-year warranties)
    - APA Geoballast Ground Mount Racking System
    - Non-Export Controls
    - Weather Station
    - Electrical Materials and Balance of System Components
    - Shipping Container to House Inverters and Switchgear
- Installation and Project Fees
    - Labor to install and commission the solar array
    - Labor to trench and install underground conductors
    - Labor to interconnect to WWTP side 2 electrical
    - Labor to remove cluster of trees on SW corner of proposed PV array
    - Permit and interconnection application fees
- Preconstruction and General Requirements
    - Job site safety and insurance
    - Truck fees, travel expenses, and tools/equipment
    - McKinstry procurement and project administration
    - McKinstry project management (4 hours per week for 10 weeks)
    - McKinstry job site supervision (4 hours per week for 10 weeks)
    - McKinstry overhead and profit
    - Bonding and Montana 1% gross receipts tax
- Measurement and Verification
    - 3 years of guaranteed savings measurement and verification reporting
    - 3 years of cellular modem service to support data collection

Scope of Work

- Clarifications and Exclusions
    - 20-year extended inverter warranties are included
    - Operations and maintenance costs are excluded
    - Fencing around the solar PV array is excluded
    - Blasting and/or excavating large rock, concrete, buried waster, or similar impediments encountered during trenching is excluded
    - SWPPP permitting and an allowance for basic erosion controls are included

2.2 Design Documents and Product Data

Design documents, including an electrical line diagram, Helioscope report with the physical PV array layout, equipment placement, and estimated energy production for the solar array, are provided in Appendix A.

Manufacturer product data sheets for the solar modules, inverters, and racking system are included in Appendix B.

Energy Cost Savings and Guarantees

3.1 GUARANTEE OVERVIEW AND SAVINGS SUMMARY

1. Philosophy: McKinstry is prepared to guarantee any portion of a project's energy savings over which it has direct control. Where McKinstry does not have direct control, such as solar insolation (weather) or non-export energy curtailment in response to the wastewater plant's electrical loads (demand), we have used engineering best practices to quantify those factors and will work with the customer to devise a method of Measurement and Verification (M&V) which provides the highest degree of assurance that the anticipated energy cost savings have been achieved.

2. Savings Summary: For this project, McKinstry is prepared to guarantee the performance of the installed initiatives to produce solar electricity. For the target cost savings for the initiatives that will be implemented please refer to Table 3.1. Based upon the stipulated conditions and the utility rates as described below, the target utility cost savings are also shown in Table 3.1.

Table 3.1	Guaranteed Electricity Production (kWh)	Cost Savings ($)
Year 1	351,428	$ 31,629
Year 2	349,671	$ 32,729
Year 3	347,923	$ 33,868

3. The cost of the first three (3) years of Performance Assurance is included in the project scope as required by Montana law. The cost of On-going Performance Assurance in years 4-20 is at the discretion of the City of Missoula. McKinstry is prepared to continue the guarantee as long as the City of Missoula continues the on-going services as described herein. When the City of Missoula chooses to cancel the ongoing services, the guarantee will also be terminated at the same point in time.

3.2 PERFORMANCE ASSURANCE METHODOLOGY

1. Guarantees: Table 3.1 provides the specific energy production and the guarantee that McKinstry will provide associated with that measure. Savings calculations are based upon both baseline operating characteristics and proposed operation criteria:

   A. Baseline: "Baseline" refers to the existing operating characteristics that were used to calculate energy cost savings. For a solar PV project the baseline energy production is zero kWh as show in table 3.2.

   B. Proposed: The proposed operating criteria, including measurement and verification methodology and key performance indicators, which were used for savings calculations are provided in Table 3.2:

Table 3.2	Facility	M&V Option	Key Performance Indicators	KPI Value
Solar PV	Missoula WWTP Side 2	Option B Measured Energy Production	Solar Energy Production (kWh)	Electricity Production per Table 3.1
			Weather (kWh/m^2)	Solar Insolation per Helioscope Report in Appendix A
			Energy Curtailment (%)	1% allowable annual energy curtailment
			System Availability (%)	100% annual system availability

Energy Cost Savings and Guarantees

2. Performance Assurance (PA)
   A. Years 1-3: For this project, McKinstry proposes reporting of the PA tasks as provided in Table 3.2 on a one-time basis per year for the first three years per Montana law. The scope of this report consists of the tasks outlined in Table 3.2. The first report shall be provided no later than one year after last date of Notice of Commencement of Energy Savings. However, if additional phases of work are involved, a single PA Report may be provided at regular interval(s) that reports across all relevant phases of work.

   B. Years 4 – 20 On-going Reporting: At this point, this proposal does not contain any guarantee past Year 3. The city can elect to continue the performance guarantee beyond year 3 by negotiating ongoing measurement and verification performance assurance service with McKinstry.

   C. Reporting Methodology: Table 3.2 provides the specific Key Performance Indicators that McKinstry will measure to verify anticipated energy cost savings are achieved. Below is a description of how each KPI will be used to determine the guaranteed energy savings are realized:

      1) Primary KPI: The primary KPI is the most important factor used to evaluate project performance, and it includes:

         Solar Energy Production (kWh): Solar energy production will be the primary KPI and shall be measured via the inverter monitoring system to determine if the guaranteed electricity production is achieved during each performance year.

      2) Secondary KPIs: Secondary KPIs are used if the primary KPI indicates the guaranteed electricity production was not achieved to determine the cause for the variance and if that variable was something within McKinstry's control. Secondary KPIs used for variance investigation shall include:

         Weather (Solar Insolation): Instantaneous solar irradiance (W/m^2) will be measured by a weather station installed on the solar PV array and the solar insolation (irradiance over time - kWh/m^2) will be compared to the average weather year data used in the Helioscope report to calculate energy production. Variances between the expected KPI value and the measured KPI value will be used to weather normalize energy production to account for cloud cover, snow, wildfire smoke, and other factors outside of McKinstry's control.

         Energy Curtailment (%): Energy curtailment will be monitored using the inverter monitoring system. McKinstry evaluated interval demand data for the WWTP side 2 and sized the solar PV array for less than 1% annual energy curtailment to avoid energy export which is prohibited by NorthWestern Energy. Variances between the expected KPI value and the measured KPI value will be used to normalize energy production to account for changes in the WWTP plant's operation and demand profile which are outside of McKinstry's control.

         System Availability (%): System availability will be monitored using the inverter monitoring system. McKinstry anticipates 100% system availability and variances between the expected KPI value and the measured KPI value will be used to normalize energy production to account for system downtime which may or may not be in McKinstry's control. Examples of system downtime events which are outside of McKinstry's control include:

         - Downtime as a result of a grid power outage
         - Downtime as a result of a maintenance shutdown of the WWTP
         - Downtime resulting from damage to the solar PV array resulting from vandalism or extreme weather
         - Downtime resulting from equipment failure covered by a manufacturer's warranty

C. Owner's Responsibility: Systems must be operated per the proposed criteria to ensure energy cost savings are realized. McKinstry will provide the initial start-up and commissioning of the system to ensure it is operating per the proposed KPI values. The City of Missoula acknowledges their shared responsibility to ensure that these criteria are maintained and will notify McKinstry if there is a material change in the operation of the solar PV array so action can be taken to mitigate loss of energy production.

3.3 UTILITY RATES AND ESCALATION

1. Utility Rate: Energy savings guarantees under this contract are based on energy production only. Utility rates and annual escalation, as agreed upon by Owner, have been used to estimate energy dollar savings. Actual dollar savings realized will be determined by the guaranteed energy production and the utility rates charged by the utility during the pertinent period.

2. Baseline Utility Rate and Escalation: baseline utility rates and annual escalation used in the financial analysis for this project were determined by analyzing NorthWestern Energy's GS-1 Secondary Demand rate schedule and historic rate increases to determine the rates outlined below in Table 3.3.

Table 3.3	Utility Rate ($/kWh)	Annual Utility Rate Escalation
Year 1	$ 0.0900	4.0%
Year 2	$ 0.0936	4.0%
Year 3	$ 0.0973	4.0%

Project Financials

4.1 PROJECT COST

McKinstry guarantees that the project cost for the scope of work listed in section 2 will not exceed $786,995 as outlined in the detailed construction budget below.

Missoula Resource Recovery Facility
Phase 2 Solar PV Array Construction Cost

12/3/2025

Category of Work	Project Budget	Notes
Architectural, Engineering, and Preconstruction Fees		
PreConstruction/Procurement	$ 2,311	
Engineering Design	$ -	Included in IGA fee
Specialty Consultant and Inspection Fees		
Arc Fault Study	$ 2,500	
Geotech	$ -	
Survey	$ -	
Construction		
01 General Requirements	$ 19,307	Project management and jobsite supervision (4 hours/week for 10 weeks)
11 Equipment	$ 5,000	Skid steer rental
26 05 00 Electrical - General	$ 77,000	Electrical Proposal by Pete's Electric
26 31 00 Electrical - Photovoltaic Systems	$ 499,989	Solar Proposal by OnSite Energy w/weather station and cell modem less 1% GRT
31 22 00 Earthwork - Grading	$ 25,574	Trenching Proposal by Grant Creek plus equipment rental fee & DC trenching
31 25 00 Earthwork - Erosion Control	$ 7,900	SWPPP Erosion Controls
Miscellaneous		
SWPPP Permit Fee - City of Missoula	$ 500	SWPPP Permit
3 Yrs Measurement & Verification	$ 9,240	3 Yrs M&V Reporting + Cell Modem Service
Contractor Overhead and Profit		
Overhead	$ 63,000	Insurance, Tools/Equipment, Home Office, and Admin/Management
Profit	$ 55,000	
Owner's Contingency	$ -	
Bonding	$ 11,805	
Montana Gross Receipts Tax	$ 7,869	
TOTAL	$ 786,995	

Project Financials

4.2 PROJECT CASHFLOW PROFORMA

The table below shows the projected costs and savings over the project's useful life and financial statistics including levelized cost of energy, net present value, and 20-year net cashflow. Please note that McKinstry does not warrant or guarantee the availability of tax credits included in this financial analysis and we encourage our clients to consult with a tax professional to confirm eligibility.

Nominal Levelized Cost of Electricity ($/kWh)	**$0.0909**				
Real Levelized Cost of Electricity ($/kWh)	**$0.0598**	**Net Present Value**	**$231,174**	**20-year Net Cashflow**	**$1,762**

SYSTEM SIZE/COST	
PV System Size (kW)	275.00
Yield (kWh/kW)	1304.00
Assumed PV Degredation	0.50%
Percent of Electricity Consumed	98%
Install Price Per Watt	$3.04
IGA Fee	$48,169
Construction Cost	$786,995
Total Project Cost (IGA + Construction)	$835,164
Current Utility Rate	$0.090
Assumed Utility Rate Escalation	4.0%
Corporate Tax Rate	0%
Depreciation Tax Basis	0%
Bonus Depreciation (Year 1)	0%
Discount Rate	4%
ITC %	30%
Investment Tax Credit Value	$250,549
PV SYSTEM CASH/FINANCING AMOUNTS	
Owners Cash Contribution	$48,169
Loan Amount	$536,446
Loan Interest Rate	4.75%
Loan Term (yrs)	20
Loan Origination Fee	$0
Loan Application Fee	$0
Total Loan Closing Costs	$0
Total Capital Expenditure	$835,164

PROJECTED 30 YEAR ENERGY AND $ VALUES			
	Annual kWh	**Utility Rate**	**SAVINGS ($)**
Year 1	351,428	$0.0900	$31,629
Year 2	349,671	$0.0936	$32,729
Year 3	347,923	$0.0973	$33,868
Year 4	346,183	$0.1012	$35,047
Year 5	344,452	$0.1053	$36,266
Year 6	342,730	$0.1095	$37,528
Year 7	341,016	$0.1139	$38,834
Year 8	339,311	$0.1184	$40,186
Year 9	337,614	$0.1232	$41,584
Year 10	335,926	$0.1281	$43,032
Year 11	334,247	$0.1332	$44,529
Year 12	332,575	$0.1386	$46,079
Year 13	330,913	$0.1441	$47,682
Year 14	329,258	$0.1499	$49,341
Year 15	327,612	$0.1559	$51,059
Year 16	325,974	$0.1621	$52,835
Year 17	324,344	$0.1686	$54,674
Year 18	322,722	$0.1753	$56,577
Year 19	321,109	$0.1823	$58,546
Year 20	319,503	$0.1896	$60,583
Year 21	317,905	$0.1972	$62,691
Year 22	316,316	$0.2051	$64,873
Year 23	314,734	$0.2133	$67,131
Year 24	313,161	$0.2218	$69,467
Year 25	311,595	$0.2307	$71,884
Year 26	310,037	$0.2399	$74,386
Year 27	308,487	$0.2495	$76,974
Year 28	306,944	$0.2595	$79,653
Year 29	305,410	$0.2699	$82,425
Year 30	303,883	$0.2807	$85,293
Total	**9,812,981**	**N/A**	**$1,627,385**

Project Financials

CASH FLOW ANALYSIS										
Timeline	**Cap Ex**	**Debt**	**O&M**	**Financing**	**Tax Credit Financing**	**Tax Credit**	**Depreciation**	**Utility Savings**	**Net Savings**	**Cash Position**
Year 0	-$835,164	-$11,901	$0	$536,446	$250,549	$0	$0	$1,216	-$58,854	-$58,854
Year 1	0	-$31,629	$0		-$250,549	$250,549	$0	$31,629	$0	-$58,854
Year 2	0	-$32,729	$0			$0	$0	$32,729	$0	-$58,854
Year 3	0	-$33,868	$0			$0	$0	$33,868	$0	-$58,854
Year 4	0	-$35,047	$0			$0	$0	$35,047	$0	-$58,854
Year 5	0	-$36,266	$0			$0	$0	$36,266	$0	-$58,854
Year 6	0	-$37,528	$0			$0	$0	$37,528	$0	-$58,854
Year 7	0	-$38,834	$0			$0	$0	$38,834	$0	-$58,854
Year 8	0	-$40,186	$0			$0	$0	$40,186	$0	-$58,854
Year 9	0	-$41,584	$0			$0	$0	$41,584	$0	-$58,854
Year 10	0	-$43,032	$0			$0	$0	$43,032	$0	-$58,854
Year 11	0	-$44,529	$0			$0	$0	$44,529	$0	-$58,854
Year 12	0	-$46,079	$0			$0	$0	$46,079	$0	-$58,854
Year 13	0	-$46,335	$0			$0	$0	$47,682	$1,347	-$57,507
Year 14	0	-$46,335	$0			$0	$0	$49,341	$3,006	-$54,500
Year 15	$0	-$46,335	$0			$0	$0	$51,059	$4,723	-$49,777
Year 16	0	-$46,335	$0			$0	$0	$52,835	$6,500	-$43,277
Year 17	0	-$46,335	$0			$0	$0	$54,674	$8,339	-$34,938
Year 18	0	-$46,335	$0			$0	$0	$56,577	$10,242	-$24,697
Year 19	0	-$46,335	$0			$0	$0	$58,546	$12,210	-$12,486
Year 20	0	-$46,335	$0			$0	$0	$60,583	$14,248	$1,762
Year 21	0	$0	$0			$0	$0	$62,691	$62,691	$64,453
Year 22	0	$0	$0			$0	$0	$64,873	$64,873	$129,326
Year 23	0	$0	$0			$0	$0	$67,131	$67,131	$196,456
Year 24	0	$0	$0			$0	$0	$69,467	$69,467	$265,923
Year 25	0	$0	$0			$0	$0	$71,884	$71,884	$337,807
Year 26	0	$0	$0			$0	$0	$74,386	$74,386	$412,193
Year 27	0	$0	$0			$0	$0	$76,974	$76,974	$489,167
Year 28	0	$0	$0			$0	$0	$79,653	$79,653	$568,820
Year 29	0	$0	$0			$0	$0	$82,425	$82,425	$651,245
Year 30	0	$0	$0			$0	$0	$85,293	$85,293	$736,538
Total	**-$835,164**	**-$843,895**	**$0**	**$536,446**	**$0**	**$250,549**	**$0**	**$1,628,602**	**$736,538**	

Appendix

5.1 Appendix A: Design Documents

PV SYSTEM EQUIPMENT SCHEDULE

A(1-500). PV MODULES (APTOS DNA-144-BF10-550W-DG)
B(1-4). INVERTER
- SMA SUNNY TRIPOWER CORE 1
- 50 kW, 64 A RATED, 480 VAC 3ϕ
- SMA SENSOR MODULE IN LEADER INVERTER

C. AC COMBINER PANEL
- 400 A RATED, 400 A MAIN BREAKER, 600 VAC 3ϕ

D. TRANSFORMER
- MODEL TBD - TO POWER FIBER PATCH PANEL WITH 15 AMP LOW SIDE BREAKER

E. FIBER PATCH PANEL

F. PV AC DISCONNECT, FUSIBLE, 400 A, 600 VAC
- 350 A CLASS R FUSES
- EXTERNAL, LOCKABLE, VISIBLE LOAD BREAK
- WITHIN 10 FT OF METER

G. ZERO-EXPORT CONTROLS
- NEMA 4X ENCLOSURE
- SMA DATA MANGER M
- WATTSON-MARK II ENERGY METER WITH 1200 AMP CTS
- POWER SUPPLY: RACPRO1-T240/24
- CELLULAR MODEM FOR INTERNET
- SEL751 WITH 1200 AMP CTS

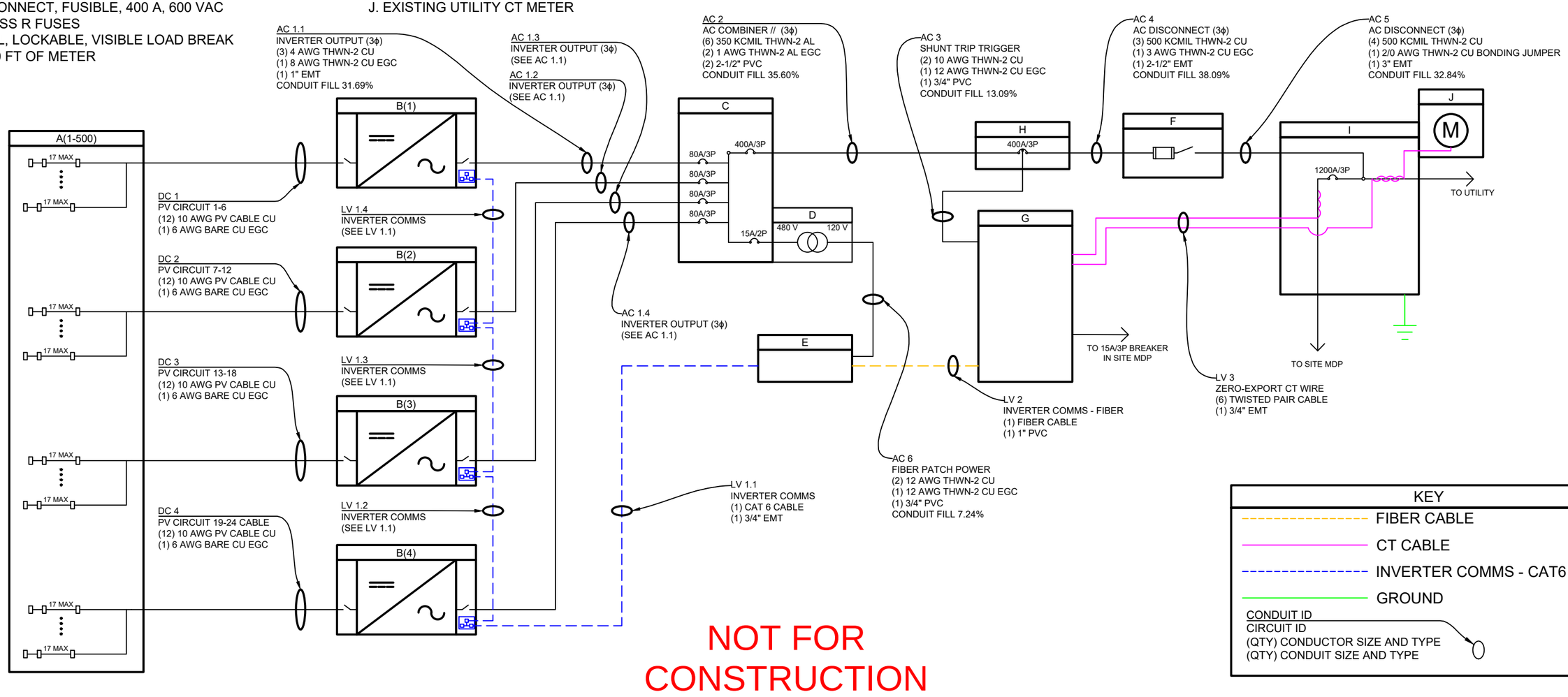
H. MAIN BREAKER DISCONNECT ENCLOSURE
- L600AWKMC
- L FRAME SHUNT TRIP BREAKER, 400 A RATED, 480 VAC 3ϕ

I. EXISTING UTILITY METER MAIN PANEL
- 1200 A RATED BUS BAR, 1200 A MAIN BREAKER
- PV INTERCONNECTION WITH NEW SUPPLY SIDE LUGS

J. EXISTING UTILITY CT METER

NOTES:

1. PV AC DISCONNECT "F" SHALL BE EXTERNAL, LOCKABLE, VISIBLE LOAD BREAK
2. PV AC DISCONNECT "F" SHALL BE WITHIN 10 FT OF THE METER
3. PVC CONDUIT THAT TRANSITIONS FROM BELOW TO ABOVE GRADE SHALL BE SCHEDULE 80.
4. ALL EXTERIOR ENCLOSURES TO BE NEMA 3R OR GREATER FOR GENERAL ELECTRIC EQUIPMENT AND NEMA 4X FOR DATA/CONTROL EQUIPMENT.
5. ALL CONTROL CABLE MUST BE RATED TO THE HIGHEST VOLTAGE PRESENT WITHIN THE SAME RACEWAY.
6. THE GIVEN PARALLEL CONDUCTOR SPECIFICATION YIELDS A MAXIMUM INVERTER OUTPUT VOLTAGE OF ~515 VAC L-L.
- INTERCONNECTION TYPE: 705.11



NOT FOR CONSTRUCTION

KEY
- FIBER CABLE
- CT CABLE
- INVERTER COMMS - CAT6 CABLE
- GROUND

CONDUIT ID
CIRCUIT ID
(QTY) CONDUCTOR SIZE AND TYPE
(QTY) CONDUIT SIZE AND TYPE

VARIOUS ARRAYS | *NORTHERN ARRAY* | *SERVICE ENTRANCE OUT BUILDING*

Status: <50% design
Revision: D
Drawn By: David Kirk

Rev	Revision Notes	Date	Drawn By
A	PRELIMINARY SLD	11/5/2025	DK
B	ADD INVERTER AND SENSOR MODULE	11/6/2025	DK
C	RECONFIGURE DISCONNECTS	11/10/2025	DK
D	REMOVE 5TH INVERTER	12/2/2025	DK

Engineering Stamp: NOT FOR CONSTRUCTION

Company Contact Info
Company Name: ONSITE ENERGY, INC.
Company Address: 1515 N ROUSE AVE BOZEMAN, MT 59715
Company Phone: (406) 551-6135
Electrical Lic. #: ELE-UCO-LIC-36713

OnSite Energy
SOLAR DESIGN & INSTALL

Customer: City of Missoula WWTP
Project: MISSOULA WASTE WATER TREATMENT PLANT PHASE 2
Location: 1100 Clark Fork Ln, Missoula MT 59808

Sheet Name: ELECTRICAL: LINE DIAGRAM
Project Manager: Keith Wickman
Project Manager Phone: 970-759-8477
Sheet Title: PV E2.1
Checked By: ----

Design 1 - 4 inverters Missoula WWTP Phase 2 1100 Clark Fork Ln, Missoula, MT 59808, USA

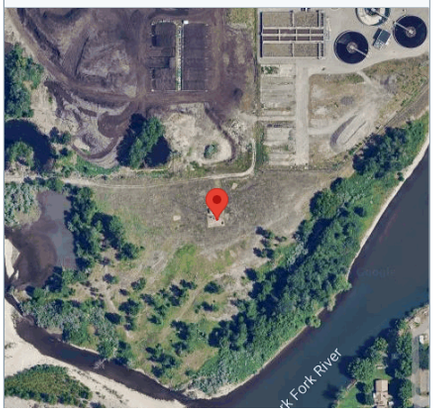
Project Details

Address	1100 Clark Fork Ln, Missoula, MT 59808, USA
Customer Name	City of Missoula
Owner	Blake Bjornson
Last Modified	Blake Bjornson 7 days ago
Location	(46.87745953868148, -114.04445243429754) (GMT -7)

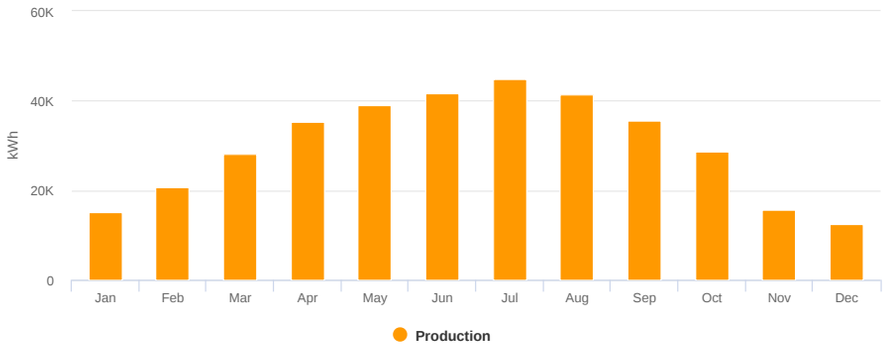
System Metrics

Design	Design 1 - 4 inverters
Module DC Nameplate	275.00 kW
Inverter AC Nameplate	200.00 kW Load Ratio: 1.38
Annual Production	358.7 MWh
Performance Ratio	80.9%
kWh/kWp	1,304.4
Weather Dataset	TMY, MISSOULA INTERNATIONAL AP, NSRDB (tmy3)
Simulator Version	14aaf3282e-56812526cf-de2f6bde27-bfc843125a

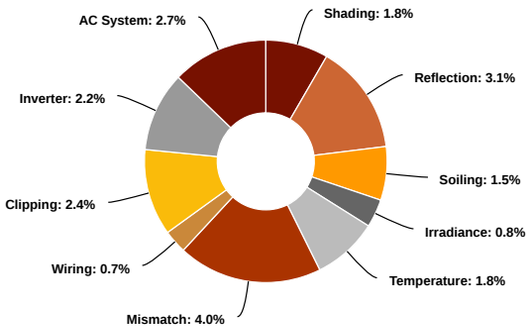
Project Location



Energy Consumption



System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	1,379.8	-
	POA Irradiance	1,613.3	16.9%
	Shaded Irradiance	1,585.0	-1.8%
	Irradiance After Reflection	1,536.2	-3.1%
	Irradiance After Soiling	1,513.2	-1.5%
	Total Collector Irradiance	**1,513.2**	**-0.0%**
Energy (kWh)	Nameplate	416,094.2	-
	Output at Irradiance Levels	412,820.9	-0.8%
	Output at Cell Temperature Derate	405,265.4	-1.8%
	Output after Electrical Mismatch	388,914.1	-4.0%
	Optimal DC Output	386,367.9	-0.7%
	Constrained DC Output	377,016.9	-2.4%
	Inverter Output	368,610.4	-2.2%
	Energy to Grid	**358,709.9**	**-2.7%**

Temperature Metrics	
Avg. Operating Ambient Temp	11.1°C
Avg. Operating Cell Temp	19.3°C

Simulation Metrics	
Operating Hours	4,677
Solved Hours	4,677
Pending Hours	-
Error Hours	-

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, MISSOULA INTERNATIONAL AP, NSRDB(tmy3) (download)
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	-0.08	3.0°C
Flush Mount	-2.81	-0.05	0.0°C
East-West	-3.56	-0.08	3.0°C
Carport	-3.56	-0.08	3.0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Albedo

J	F	M	A	M	J	J	A	S	O	N	D
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Rear Mismatch Loss	10%	**Rear Shading Factor**	5%
Module Transparency	0%		
Irradiation Variance	5.0%		
Cell Temperature Spread	4.0°C		
Module Binning Range	-2.5% to 2.5%		
AC System Derate	0.50%		

Component Characterizations

Type	Component	Characterization	Bifacial
Module	DNA-144-BF10-550W-DG (Aptos Solar)	Spec Sheet Characterization, PAN	False
Inverter	Sunny Tripower_Core1 50-US-41 (SMA)	Default Characterization	N/A

Design BOM

Component	Type	Quantity
10 AWG (Copper)	AC Home Runs	4
500 MCM (Copper)	AC Home Runs	1
4 input AC Panels	AC Panels	1
Sunny Tripower_Core1 50-US-41 (SMA)	Inverters	4
Aptos Solar, DNA-144-BF10-550W-DG, (550W)	Modules	500
10 AWG (Copper)	Strings	32

Monthly Shading

Month	GHI (kWh/m^2)	POA (kWh/m^2)	Shaded (kWh/m^2)	Nameplate (kWh)	Grid (kWh)
January	41.4	63.8	61.1	16,005.1	15,084.2
February	58.6	87.3	85.2	22,379.9	20,603.0
March	97.2	121.4	119.1	31,278.4	28,117.3
April	140.8	158.5	156.3	41,039.7	35,328.5
May	173.2	177.5	175.2	45,912.7	39,108.9
June	192.8	190.8	188.9	49,485.8	41,768.2
July	206.2	209.4	207.5	54,457.6	44,977.2
August	177.4	194.0	191.6	50,331.2	41,542.1
September	130.0	164.0	161.4	42,498.1	35,493.8
October	85.1	126.2	123.9	32,599.9	28,621.6
November	43.3	67.1	64.6	16,948.1	15,649.7
December	33.8	53.4	50.3	13,157.6	12,415.3

Design Wiring Zone

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

Design Render

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Portrait (Vertical)	Module: 30°	Module: 180°	25.0 ft	2x1	250	500	275.00 kW

Appendix

5.2 Appendix B: Manufacturer Product Data Sheets

DNA™ 144-Bifacial Dual Glass

Solar for Innovators

aptos™ solar technology

DNA-144-BF10-550W-DG

Residential | Commercial

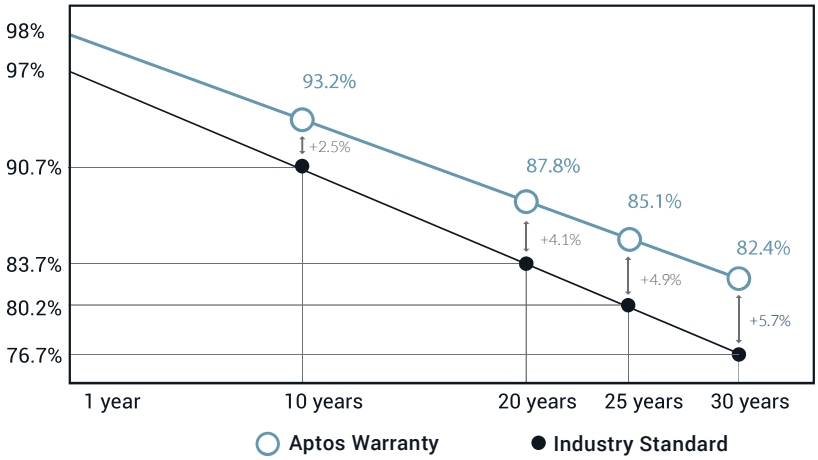
Industry Leading 30 Years Product and Performance Warranty

Our DNA Split Cell Series uses advanced selective emitter PERC technology with thin film layers to improve heat tolerance, maximize energy harvest, minimize resistive loss, and use 5% more of the available active area for optimal power performance.

540W | 545W | 550W

Designed & Engineered In Silicon Valley

Linear Performance Warranty



Key Features

Advanced Technology

Patented DNATM technology boosts power performance & module efficiency.

Durable Design

Robust product design is resilient in extreme weather. Up to 5400 Pa snow load and 4000 Pa wind load

Awards

Winners of the Leadership in Solar Energy award for three consecutive years and listed as one of the Top Solar Products from 2021-2022.

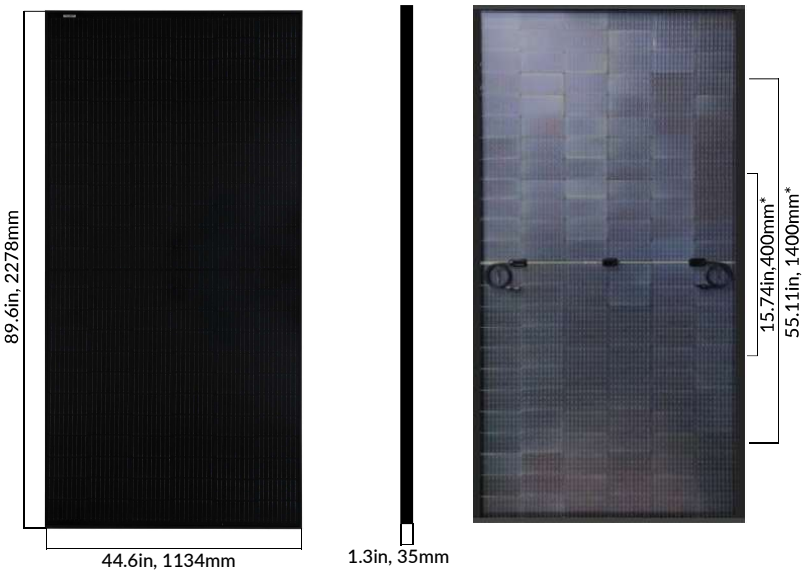
Bankable Investment

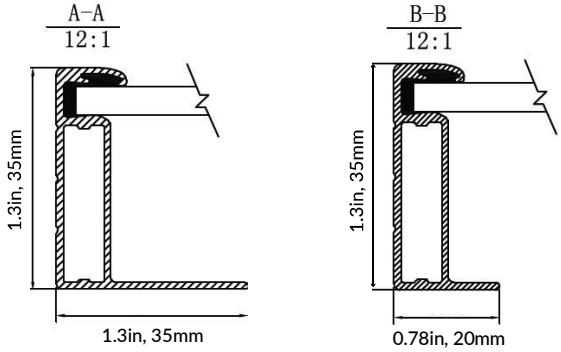
Comprehensive warranty that covers both **30-year product** and **30-year power** performance.

Aesthetics

All black design with advanced split cell technology features 10 ultra-thin busbars that allow for less resistance and greater energy harvest.

DNA™ 144 Bifacial Dual Glass





Electrical Specifications

	DNA-144-BF10-540W-DG		DNA-144-BF10-545W-DG		DNA-144-BF10-550W-DG	
	STC	NOCT	STC	NOCT	STC	NOCT
Rated Output P_{mpp} (W)	540W	404W	545W	408W	550W	411W
Open Circuit Voltage V_{VOC} (V)	49.50	46.76	49.70	46.84	49.80	46.93
Short Circuit Current I_{SC} (A)	13.85	12.15	13.92	12.24	13.99	12.33
Rated Voltage V_{mp} (V)	41.70	38.34	41.80	38.41	42.00	38.48
Rated Voltage I_{mp} (A)	12.97	10.54	13.04	13.02	13.11	10.70
Module Efficiency	20.90%		21.09%		21.29%	

STC for front-face of panel: 1000 W/m², 25°C, measurement uncertainty ≤3%
NOCT for front-face of panel: 800W/m²,45°C, Wind speed 1 m/s

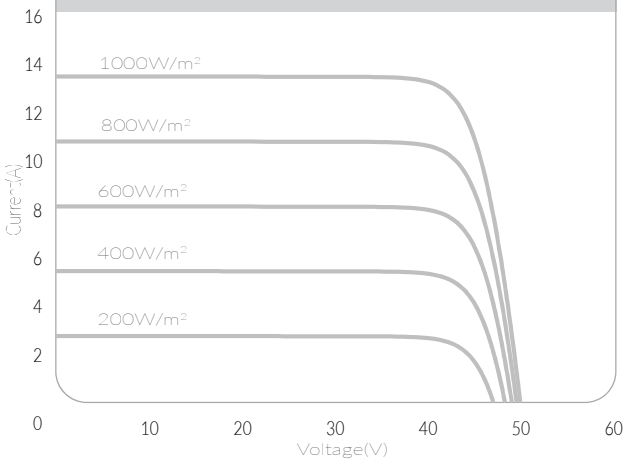
Mechanical Properties

Cell Type	SE-PERC
Glass	Glass Thickness: Front Glass : 2mm, Rear Glass : 2mm, AR Coating, High Transmission, Low Iron, Semi-Tempered Dual Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68
Dimensions	89.68 X 44.6 X 1.3 in, 2278 X 1134 X 35 mm
Weight	71.20 lbs
Output Cable	4mm² (EU)12AWG,(1200mm)
Cable Length	47.2in, 1200mm
Connector Type	Staubli EVO2

Bifacial Output-Rearside Power Gain

5%-Maximum Power (Pmax)	567W	572W	578W
5%-Module Efficiency STC(%)	21.94%	22.14%	22.35%
15%-Maximum Power (Pmax)	621W	627W	633W
15%-Module Efficiency STC(%)	24.03%	24.27%	24.50%
25%-Maximum Power (Pmax)	675W	682W	688W
25%-Module Efficiency STC(%)	26.12%	26.40%	26.63%

I-V Curve



Test Operating Conditions

Maximum Series Fuse	30A
Maximum System Voltage	1,500 VDC (UL&IEC)
Maximum Load Capacity (Per UL 1703)	5400 Pa Snow Load / 4000 Pa Wind Load
Fire Performance Class	Type 29

Temperature Coefficients

Temperature Coefficients P_{mmp}	-0.335%/°C
Temperature Coefficients I_{sc}	+0.036%/°C
Temperature Coefficients V_{OC}	-0.277%/°C
Normal Operating Cell Temperature (NOCT)	45°C±2°C

Packaging Configuration

Modules per Pallet	31
Pallets per 40ft. Container	20
Pallet Dimensions	91.06 X 44.48 X 49.76 in
Pallet Weight (lbs)	2208
Modules per 40ft. Container	620

Certifications

C22.2 No.61730-1:19
C22.2 No.61730-2:19

IEC61730-1
IEC61730-2

UL61730-1
UL61730-2

Ref_07.28.25

8207 Callaghan Rd, Ste 100,
San Antonio, Texas 78230
www.aptossolar.com I sales@aptossolar.com

*1. Mounting hole locations shown may not reflect actual locations. Top mount clamps are recommended.
Aptos Solar Technology reserves the right to make specification changes without notice.

/ STP 33-US-41 / STP 50-US-41 / STP 62-US-41

Sunny Tripower CORE1-US

33 / 50 / 62

It stands on its own

/ New! Complies with IEEE 1547-2018 and UL 1741 SB standards

SMA Smart Connected

SMA ShadeFix

Fully integrated
- No additional racking required for rooftop installation
- Integrated DC and AC disconnects and overvoltage protection
- 12 direct string inputs for reduced labor and material costs
- Up to 60% faster commercial PV system installation

Increased power, flexibility
- Six MPP trackers for flexible stringing and maximum power production
- ShadeFix, SMA's proprietary shade management solution, optimizes at the string level
- Intelligent string monitoring to pinpoint array performance issues

Enhanced safety, reliability
- Integrated SunSpec PLC signal for module-level rapid shutdown
- DC AFCI arc-fault protection certified to Standard UL 1699B Ed. 1

Smart monitoring, control, service
- I-V curve diagnostic function to visualize and document PV string electrical characteristics
- Increased ROI with SMA ennexOS cross sector energy management platform
- SMA Smart Connected proactive O&M solution reduces time spent diagnosing and servicing in the field

The Sunny Tripower CORE1 is the world's first free-standing PV inverter for commercial rooftops, carports, ground mount and repowering legacy solar projects.

From distribution to construction to operation, the Sunny Tripower CORE1 enables logistical, material, labor and service cost reductions, and is the most versatile, cost-effective commercial solution available. Integrated SunSpec PLC for rapid shutdown and enhanced DC AFCI arc-fault protection ensure compliance to the latest safety codes and standards. With Sunny Tripower CORE1 and SMA's ennexOS cross sector energy management platform, system integrators can deliver comprehensive commercial energy solutions for increased ROI.

SunSpec Modbus for 1547 CERTIFIED

Rapid Shutdown CERTIFIED

UL 3741 LISTED PV Hazard Control

Technical data	Sunny Tripower CORE1 33-US	Sunny Tripower CORE1 50-US	Sunny Tripower CORE1 62-US
Input (DC)			
Maximum array power	50000 Wp STC	75000 Wp STC	93750 Wp STC
Maximum system voltage		1000 V	
Rated MPP voltage range	330 V … 800 V	500 V … 800 V	550 V … 800 V
MPPT operating voltage range		150 V … 1000 V	
Minimum DC voltage / start voltage		150 V / 188 V	
MPP trackers / strings per MPP input		6 / 2	
Maximum usable operating input current / per MPP tracker		120 A / 20 A	
Maximum short circuit current per MPPT / per string input		32 A / 30 A	
Output (AC)			
AC nominal power	33300 W	50000 W	62500 W
Maximum apparent power	33300 VA	53000 VA	66000 VA
Output phases / line connections		3 / 3-(N)-PE	
Nominal AC voltage		480 V / 277 V WYE	
AC voltage range		244 V … 305 V	
Maximum output current	40 A	64 A	80 A
Rated grid frequency		60 Hz	
Grid frequency / range		50 Hz, 60 Hz / -6 Hz … +6Hz	
Power factor at rated power / adjustable displacement		1 / 0.0 leading … 0.0 lagging	
Harmonics THD		<3 %	
Efficiency			
CEC efficiency	97.5%	97.5%	97.5%
Protection and safety features			
Load rated DC disconnect		●	
Load rated AC disconnect		●	
Ground fault monitoring: Riso / Differential current		● / ●	
DC AFCI arc-fault protection		●	
SunSpec PLC signal for rapid shutdown		●	
DC reverse polarity protection		●	
AC short circuit protection		●	
DC surge protection: Type 2 / Type 1+2		O / O	
AC surge protection: Type 2 / Type 1+2		O / O	
Protection class / overvoltage category (as per UL 840)		I / IV	
General data			
Device dimensions (W / H / D)		621 mm / 733 mm / 569 mm (24.4 in x 28.8 in x 22.4 in)	
Device weight		84 kg (185 lbs)	
Operating temperature range		-25 °C … +60 °C (-13 °F … +140 °F)	
Storage temperature range		-40 °C … +70 °C (-40 °F … +158 °F)	
Audible noise emissions (full power @ 1m and 25 °C)		65 dB(A)	
Topology		Transformerless	
Cooling concept		OptiCool (forced convection, variable speed fans)	
Enclosure protection rating		Type 4X, 3SX (as per UL 50E)	
Corrosivity classification according to IEC 61701		C3*	
Maximum permissible relative humidity (non-condensing)		100 %	
Additional information			
Mounting		Free-standing with included mounting feet	
DC connection		Amphenol UTX PV or H4Plus connectors	
AC connection		Screw terminals - 4 AWG to 4/0 AWG CU/AL	
LED indicators (Status / Fault / Communication)		●	
Network interfaces: Ethernet / WLAN / RS485		● (2 ports) / ▲ / O	
Data protocols: SMA Modbus / SunSpec IEEE 1547 Modbus / Webconnect		● / ● / ●	
ShadeFix technology for string level optimization		●	
Intelligent string performance monitoring		●	
I-V curve diagnostic function		●	
Integrated Plant Control / Q on Demand 24/7		● / ●	
SMA Smart Connected (proactive monitoring and service support)		●	
Certifications			
Certifications and approvals		UL 1741, UL 1699B Ed. 1, UL 1998, CSA 22.2 107-1, PV Rapid Shutdown System Equipment, UL 3741	
FCC compliance		FCC Part 15 Class A	
Grid interconnection standards		IEEE 1547-2018, UL 1741 SA/SB - CA Rule 21, HECO SRD V2.0	
Advanced grid support capabilities		L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty			
Standard		10 years	
Optional extensions		15 / 20 years	
O Optional features ● Standard features – Not available	▲ Subject to availability	Data at nominal conditions - status: 08/2023	* ≥ 2 km from the coast
Type designation	STP 33-US-41	STP 50-US-41	STP 62-US-41

Accessories

SMA Data Manager M
EDMM-US-10

SMA Sensor Module
MD.SEN-US-40

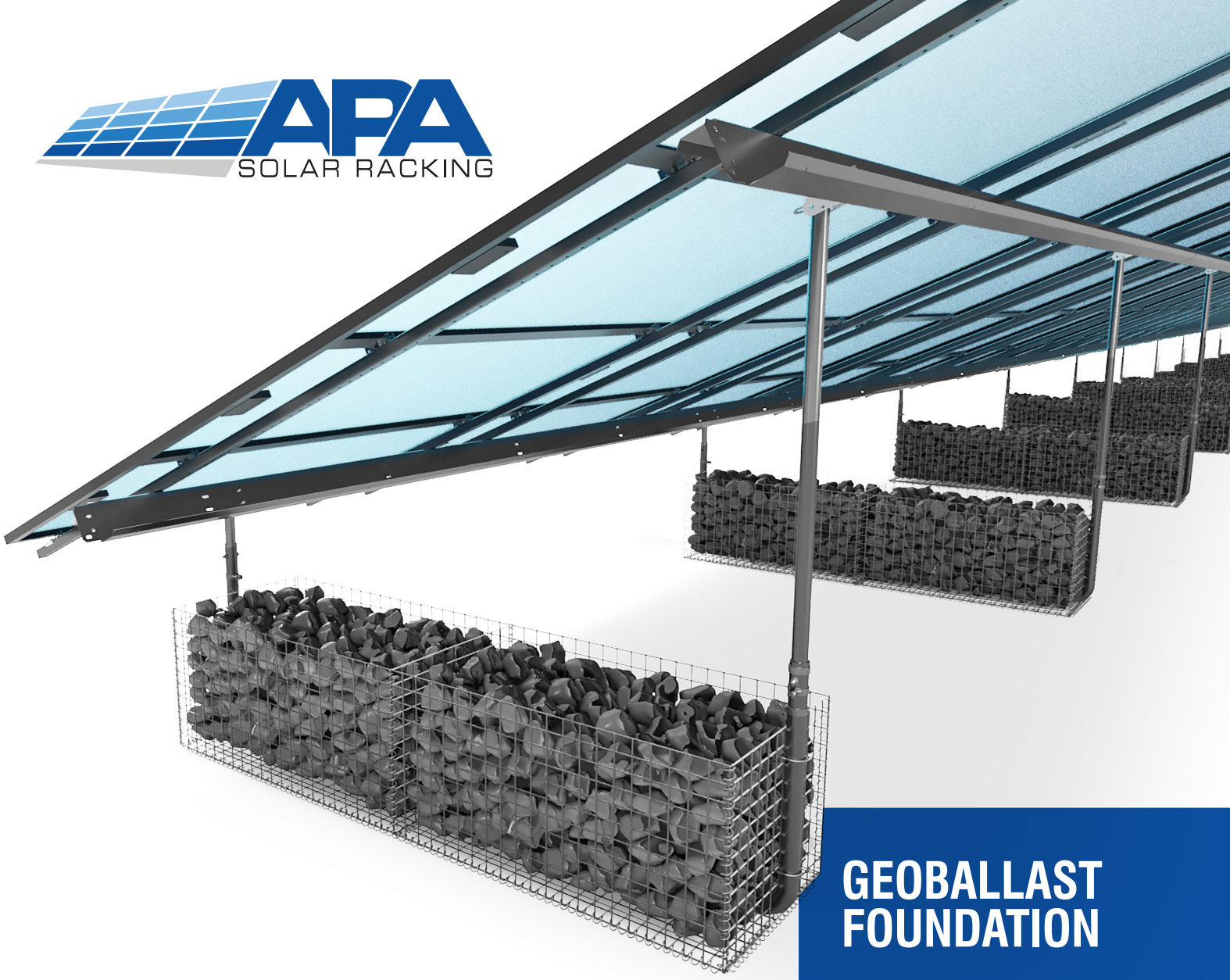
Universal Mounting System
UMS_KIT-10

AC Surge Protection Module Kit
AC_SPD_KIT1-10, AC_SPD_KIT2_T1T2
DC Surge Protection Module Kit
DC_SPD_KIT4-10, DC_SPD_KIT5_T1T2

Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC

APA SOLAR RACKING



GEOBALLAST FOUNDATION

Our **Geoballast Foundation** was developed after years of AP Alternatives installing ballasted solar projects. Concrete whether pre-cast or pour in place, proved to be an expensive and time consuming method. APA's innovative engineering and R&D teams, developed a revolutionary process for ballasted projects. Our goal was to remove all concrete and take the idea of a standard gabion basket, and engineer it to excel as a ballast solution. Our highly engineered Geoballast box has the fastest installation time and is the most cost effective product available today.

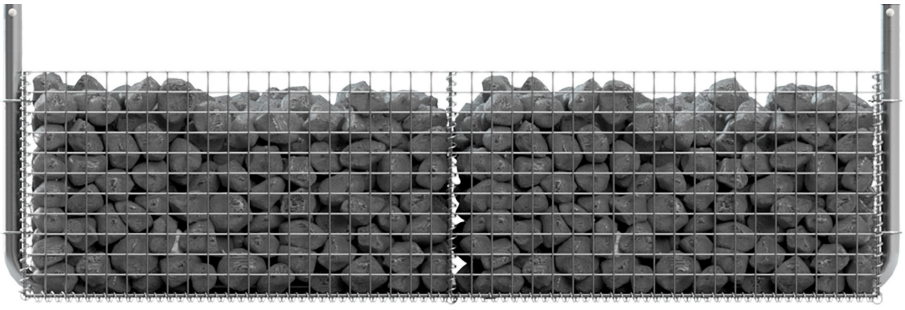
In business since 2008, APA offers the most versatile line of racking and foundation solutions for projects in even the most challenging environments. With projects nationwide, APA is a trusted quality racking partner.

NO MORE CONCRETE

By utilizing locally sourced rocks or pavers, simply drop the weight in and you're done. No more waiting on concrete trucks, renting concrete pumps, or washing out trucks/pumps onsite. No more labor hours for setting up temporary concrete molds. No more waiting 24 hours for concrete to cure. The flow and speed of your job is 100% in your control.

PRE-ASSEMBLED RAPID SETUP

The galvanized steel wire box is delivered to the site over 70% pre-assembled. Simply unfold the box, install the spiral wires and connect the anchor tubes. The Geoballast is then fully assembled and can be moved to the proper position in the row and filled with quarry rock.



20-345 COUNTY ROAD X P.O. BOX 326 RIDGEVILLE CORNERS, OH 43555 419.267.5280 WWW.APALTERNATIVES.COM

WHAT MAKES THE GEOBALLAST SYSTEM SO SPECIAL?

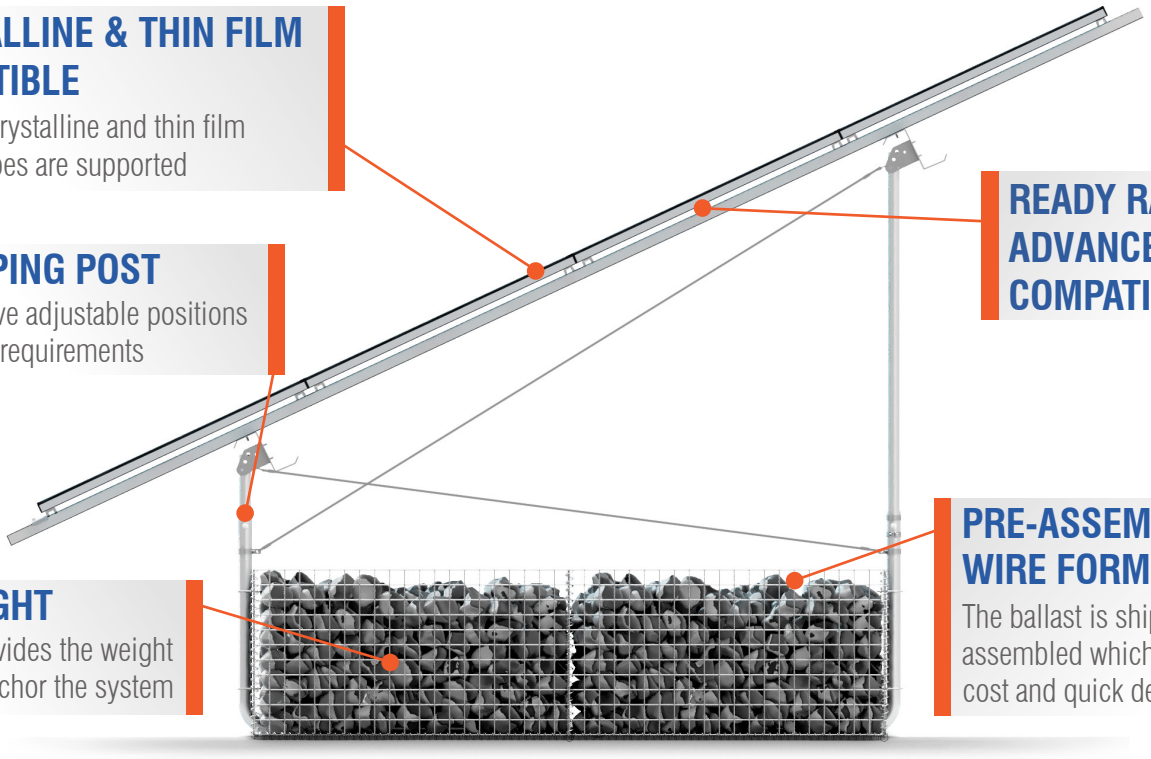
CRYSTALLINE & THIN FILM COMPATIBLE

All major crystalline and thin film module types are supported

TELESCOPING POST

Both posts have adjustable positions to match site requirements

READY RACK & ADVANCED MODULAR COMPATIBILITY

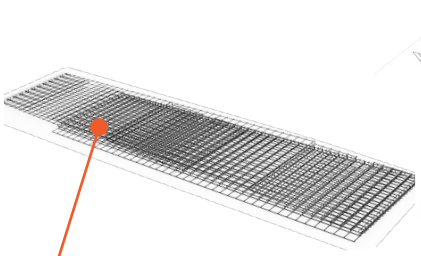


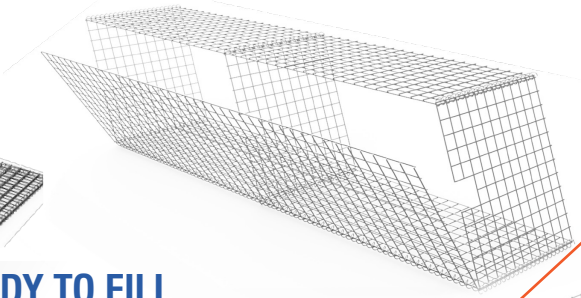
ROCK WEIGHT

Quarry rock provides the weight necessary to anchor the system

PRE-ASSEMBLED WIRE FORM

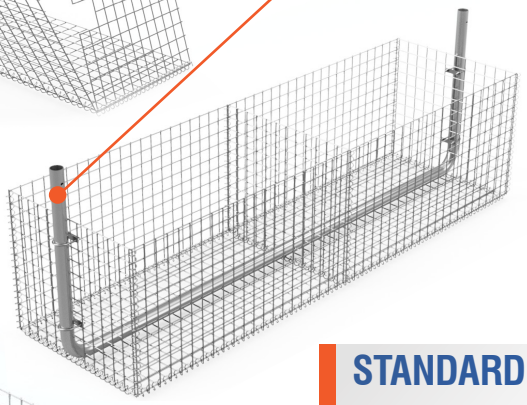
The ballast is shipped 70% assembled which allows for low cost and quick deployment





ANCHOR TUBE

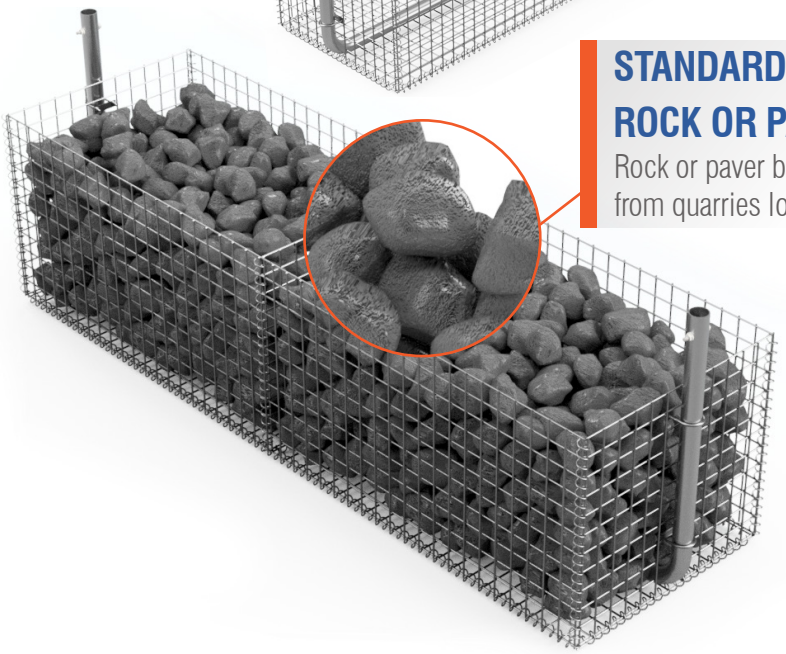
The bent tube is the connection between the ballast and the rest of the racking



FLAT PACK TO READY TO FILL

The wireform ballast is shipped preassembled, unfolds easily and is fully assembled with spiral wire

Racking Orientation: Compatible with 2 in portrait and 4 in landscape designs
Snow Load: Up to 100psf
Wind Load: Up to 130mph
Tilt Angle: Customer Specified (5-35 Degrees)
Ballast: Offers alternative to driven anchors or piles
Building Code Compliant: IBC 2015
PE Stamped Drawings: APA drawings can be PE stamped for all 50 states and territories



STANDARD QUARRY ROCK OR PAVER BLOCKS

Rock or paver blocks can be sourced from quarries local to the site.

APA SOLAR RACKING

419.267.5280 // SALES@APALTERNATIVES.COM