

100/125 kW, 1500 Vdc String Inverters for North America



CPS SCH100/125KTL-DO/US-600

The 100 and 125 kW high power CPS three-phase string inverters are designed for ground mount applications. The units are high performance, advanced and reliable inverters designed specifically for the North American environment and grid. High efficiency at 99.1% peak and 98.5% CEC, wide operating voltages, broad temperature ranges and a NEMA Type 4X enclosure enable this inverter platform to operate at high performance across many applications. The CPS 100/125 kW products ship with the Standard or Centralized Wire-box, each fully integrated and separable with AC and DC disconnect switches. The Standard Wire-box includes touch-safe fusing for up to 20 strings. The CPS FlexOM Gateway enables communication, controls and remote product upgrades.

Key Features

- NFPA 70 and NEC compliant
- Touch-safe DC Fuse holders add convenience and safety
- CPS FlexOM Gateway enables remote firmware upgrades
- Integrated AC and DC disconnect switches
- 1 MPPT with 20 fused inputs for maximum flexibility
- Copper- and Aluminum-compatible AC connections
- NEMA Type 4X outdoor rated enclosure
- Advanced Smart-Grid features (CA Rule 21 certified)
- kVA headroom yields 100 kW @ 0.9 PF and 125 kW @ 0.95 PF
- Generous 1.87 (100 kW) and 1.5 (125 kW) DC/AC inverter load ratios
- Separable wire-box design for fast service
- Standard 5-year warranty with extensions to 20 years



100/125KTL Standard Wire-box



100/125KTL Centralized Wire-box



Model Name	CPS SCH100KTL-DO/US-600	CPS SCH125KTL-DO/US-600
DC Input		
Max. PV power	187.5 kW	
Max. DC input voltage	1500 V	
Operating DC input voltage range	860-1450 Vdc	
Start-up DC input voltage / power	900 V / 250 W	
Number of MPP trackers	1	
MPPT voltage range ¹	870-1300 Vdc	
Max. PV input current (Isc x 1.25)	275 A	
Number of DC inputs	Standard Wire-box: 20 PV source circuits, pos. and neg. fused Centralized Wire-box: 1 input circuit, 1-2 terminations per pole, non-fused	
DC disconnection type	Load-rated DC switch	
DC surge protection	Type II MOV (with indicator/remote signaling)	
AC Output		
Rated AC output power	100 kW	125 kW
Max. AC output power ²	100 kVA (111 kVA @ PF>0.9)	125 kVA (132 kVA @ PF>0.95)
Rated output voltage	600 Vac	
Output voltage range ³	528-660 Vac	
Grid connection type ⁴	3Φ / PE / N (neutral optional)	
Max. AC output current @ 600 Vac	96.2 / 106.8 A	120.3 / 127.0 A
Rated output frequency	60 Hz	
Output frequency range ³	57-63 Hz	
Power factor	>0.99 (±0.8 adjustable)	>0.99 (±0.8 adjustable)
Current THD	<3%	
Max. fault current contribution (1-cycle RMS)	41.47 A	
Max. OCPD rating	200 A	
AC disconnection type	Load-rated AC switch	
AC surge protection	Type II MOV (with indicator/remote signaling)	
System		
Topology	Transformerless	
Max. efficiency	99.1%	
CEC efficiency	98.5%	
Stand-by / night consumption	<4 W	
Environment		
Enclosure protection degree	NEMA Type 4X	
Cooling method	Variable speed cooling fans	
Operating temperature range	-22°F to +140°F / -30°C to +60°C (derating from +108°F / +42°C)	
Non-operating temperature range ⁵	-40°F to +158°F / -40°C to +70°C maximum	
Operating humidity	0-100%	
Operating altitude	8202 ft / 2500 m (no derating)	
Audible noise	<65 dBA @ 1 m and 25°C	
Display and Communication		
User interface and display	LED indicators, WiFi + APP	
Inverter monitoring	Modbus RS485	
Site-level monitoring	CPS FlexOM Gateway (1 per 32 inverters)	
Modbus data mapping	SunSpec / CPS	
Remote diagnostics / firmware upgrade functions	Standard / (with FlexOM Gateway)	
Mechanical		
Dimensions (W x H x D)	Standard Wire-box: 45.28 x 24.25 x 9.84 in (1150 x 616 x 250 mm) Centralized Wire-box: 39.37 x 24.25 x 9.84 in (1000 x 616 x 250 mm)	
Weight	Inverter: 121 lbs (55 kg) Standard Wire-box: 55 lbs (25 kg) Centralized Wire-box: 33 lbs (15 kg)	
Mounting / installation angle	15 - 90 degrees from horizontal (vertical or angled)	
AC termination	M10 stud type terminal [3Φ] (wire range: 1/0 AWG - 500 kcmil CU/AL; lugs not supplied) Screw clamp terminal block [N] (#12 - 1/0 AWG CU/AL)	
DC termination	Standard Wire-box: Screw clamp fuse holder (wire range: #12 - #6 AWG CU) Centralized Wire-box: Busbar, M10 bolts (wire range: #1AWG - 500kcmil CU/AL [1 termination per pole], #1 AWG - 300 kcmil CU/AL [2 terminations per pole]; lugs not supplied)	
Fused string inputs	20 A fuses provided (fuse values up to 30 A acceptable)	
Safety		
Certifications and standards	UL 1741-SA/SB Ed. 3, CSA-C22.2 NO.107.1-01, IEEE 1547-2018, FCC PART15	
Selectable grid standard	IEEE 1547a-2014, IEEE 1547-2018 ⁶ , CA Rule 21, ISO-NE	
Smart-grid features	Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAR, Freq-Watt, Volt-Watt	
Warranty		
Standard ⁷	5 years	
Extended terms	10, 15 and 20 years	

1) See user manual for further information regarding MPPT voltage range when operating at non-unity PF.

2) "Max AC apparent power" rating valid within MPPT voltage range and temperature range of -30°C to +40°C (-22°F to +104°F) for 100 kW PF≥0.9, and 125 kW PF≥0.95.

3) The "output voltage range" and "output frequency range" may differ according to the specific grid standard.

4) Wye neutral-grounded; delta may not be corner-grounded.

5) See user manual for further requirements regarding non-operating conditions.

6) Firmware version 12.0 or later required.

7) 5-year warranty effective for units purchased after October 1, 2019.

PARK

SWITCHGEAR



*Engineered Solutions for
Power Distribution*

Switchgear

In this brochure, we present a complete range of advanced, problem-solving switchgear products that have established Park as an industry leader in power distribution systems. Shown and described are medium voltage switchgear units for many diverse applications, all featuring the Park hallmarks of modern design and cutting-edge technology. With some of the Industry's finest electrical engineers on staff, Park is ideally equipped to handle difficult custom jobs that many other companies may not have the capability to undertake.

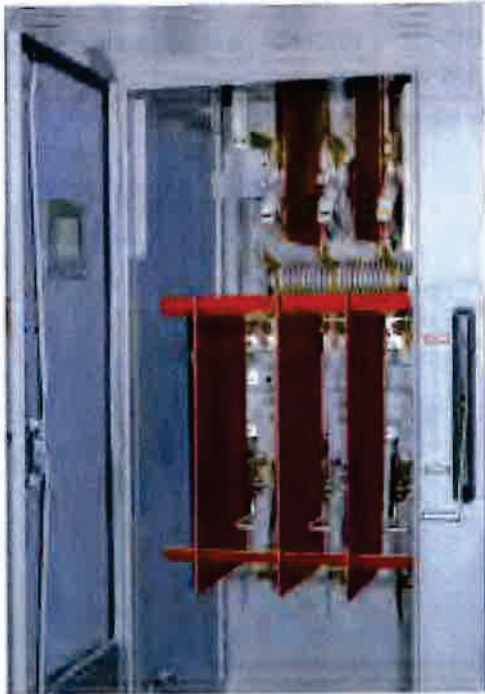
Special projects are one of our particular strengths at Park, evidenced by our outstanding record for delivering these systems on tight schedules, and often under demanding circumstances.

Whatever your switchgear requirements, you can always rely on Park to provide you with the finest, state-of-the-art products and support services.



FEATURES & ADVANTAGES

- Interrupter switches are completely factory adjusted.
- No taping of bus connections
- Built-in access control eliminates expensive fencing
- Wide-view windows allow inspection of switches from outside
- Louvers and space heaters reduce moisture
- Spare fuses store in built-in racks
- Generous access and ample work space
- Hot dipped galvanized base
- Sturdy, lockable latches
- Welded construction for security and strength
- Heavy duty hinges
- Manufactured to applicable utility standards



Metal Enclosed

Metal Enclosed Load Interrupter Switchgear

Park Switchgear configurations are limited only by your imagination.

Each unit features welded steel construction with wideview windows that allow checking switchgear without opening doors. Corrosionproof, rainproof louvers at the bottom and top, and space heaters inside each unit maintain air circulation to keep the interior dry. Three point cam-type, high-strength latches seal the doors shut. The lockable latches and screened louvers discourage tampering. Wide bulkhead doors provide easy access to all bays. Each full-length door has durable heavy-duty hinges with brass pivots. Foot operated holders lock the doors open, providing ample room for pulling cables and making terminations.

All interrupter switches are maintenance-free and are available in 200, 600, and 1200 amp ratings. S&C® Power Fuses provide full-fault-spectrum protection. The switches are manually operated by nonremovable switch handles. Bus connections are silverplated copper for long life. Continuous ground bus in multibay lineups has a short-circuit rating equal to that of the integrated assembly. The HV meter bays are built to utility specifications and multibay lineups are assembled with a minimum of interbay bolting.

Call today and discuss your requirements with a Park sales representative.

UL[®] Listed up to 15KV

SPECIFICATIONS

Ratings of S&C Mini-Ruptor Switches

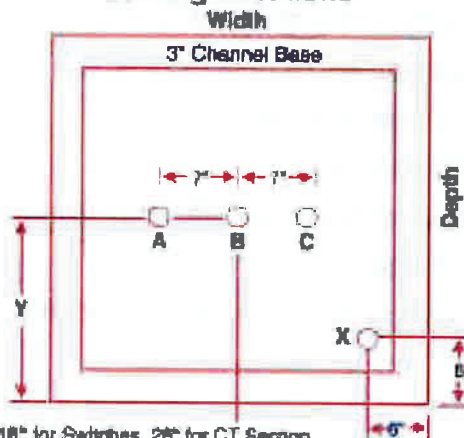
KV			Amperes, RMS					Mom. & Peak Close (ASYM KA)
Nom.	Max. Desc.	BIL	Interrupting			Mag.		
			Cont.	Load	Cap.			
5	5.5	60	600	600	35	21	40	
5	5.5	60	1200	1200	35	21	61	
15	17	95	600	600	35	21	40	
15	17	95	1200	1200	35	21	61	
25	29	125	600	400	35	21	40	
34.5	38	150	600	600	35	21	28	

Physical Sizes & Park Numbers

Park No.	Voltage KV	Height	Depth	Width
PM 315-4.8	4.8	104"	44"	42"
PM 315-15	15	104"	44"	42"
PM 315-25	25	120"	44"	42"
PM 315-35	34.5	130"	70"	60"
PM 315-CT	PT/CT Bay	to match	to match	to match
PM 315-WM	Meter Bay	to match	to match	60"

To order specify current rating & fuse size.

Cabling Locations



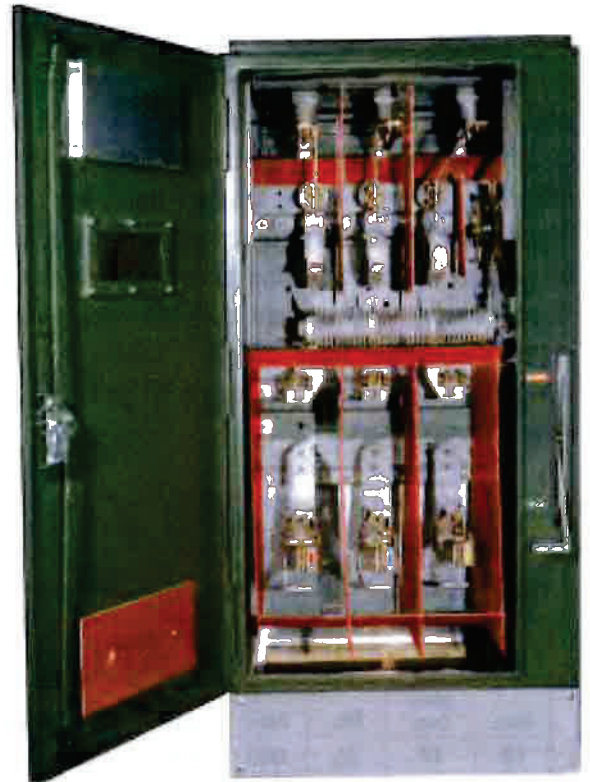
Y - 18" for Switches, 28" for CT Section
 A, B, C - Approximate Cable Termination Points
 X - Approximate Heating Cable Termination (for Sw only)



Switchgear

FEATURES & ADVANTAGES

- Interrupter switches are completely factory adjusted
- Built-in access control eliminates expensive fencing
- Standard drilling and tapping for mounting various size and manufacturers' current and potential transformers
- No taping of bus connections
- Front operator standard
- Side operator available as an option
- Louvers and space heaters reduce moisture
- Spare fuses store in built in racks
- Sturdy 3 point door latch
- Heavy duty hinges
- Sturdy, lockable latches
- Welded construction for security and strength
- Hot dipped galvanized base
- Manufactured to applicable utility standards
- Finished with one prime and two enamel coats for corrosion resistance



PM 123

Pad-mounted 15KV Primary Switch and Metering Cubicle

Each unit features welded steel construction. Corrosionproof, rainproof louvers at the bottom and top, and space heaters inside each unit maintain air circulation to keep the interior dry. Three point cam-type, high-strength latches seal the doors shut. The lockable latches and screened louvers discourage tampering. Wide bulkhead doors provide easy access. Each full-length door has durable heavy-duty hinges with brass pivots. Foot operated holders lock the doors open and provides ample room for pulling cables and making terminations.

Interruptor switches are maintenance-free and are 600 amp rated. S&C® Power Fuses provide full-fault-spectrum protection. The switches are manually operated by removable switch handles. Bus connections are silverplated copper for long life. The HV meter bays are built to utility specifications.

Call today and discuss your requirements with a Park sales representative.

UL® Listed up to 15KV

SPECIFICATIONS

Ratings of S&C Mini-Ruptor Switches

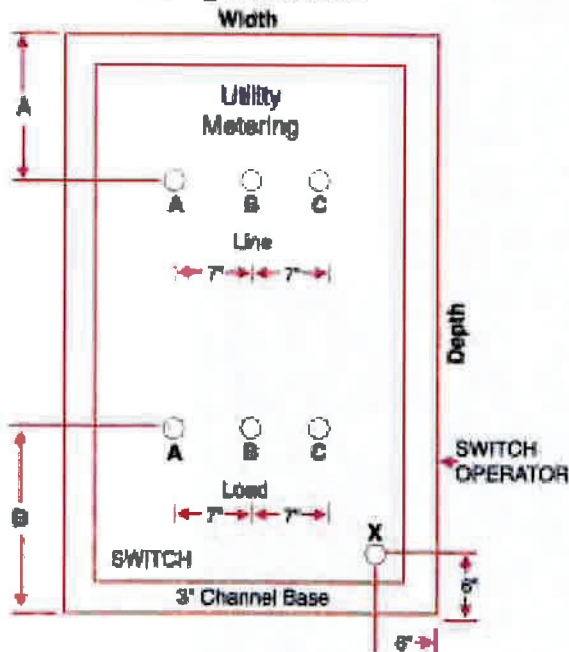
KV			Amperes, RMS					Mom. & Fault Close (ASYM KA)
Nom.	Max. Des.	BIL	Interrupting					
			Cent.	Load	Cap.	Meg.		
15	17	96	600	600	35	21	40	
25	29	125	600	400	35	21	40	

Physical Sizes & Park Numbers

Park No.	Voltage KV	Height	Depth	Width	A	B
PM 123-4.8	4.8	82"	60"	40"	19"	12"
PM 123-15	15	82"	60"	40"	19"	12"
PM 123-25	25	94"	60"	54"	19"	14"

To order specify current rating & fuse size.

Cabling Locations



A,B,C.- Approximate Cable Termination Points

X - Approximate Heating Cable Termination

NOTE: Front and rear clearance of 4' required—2' on right for handle operations



Switchgear

FEATURES & ADVANTAGES

- Welded steel construction for security and strength.
- Various combinations of switch and fuse arrangements available.
- Interrupter switches are factory adjusted.
- Built-in access control eliminates expensive fencing.
- No taping of bus connections.
- Folding switch handle stores in padlockable compartment on enclosure side.
- Sturdy 3 point lockable door latches.
- Heavy duty hinges.
- Louvers help reduce moisture.
- Manufactured to applicable utility standards.
- Hot dipped galvanized base.
- Finished with one prime and two enamel coats for corrosion resistance.



PM-265



PM-155

PM 155 & 255

Pad-mounted 15 & 25KV Switch & Fuse

All 155 and 255 units feature welded steel construction. Louvers at the top and bottom of each unit are rainproof and corrosion proof, maintain air circulation to keep interior dry. Three point cam-type, high-strength latches seal the doors shut. Lockable latches and screened louvers discourage tampering. Wide bulkhead doors provide easy access. Each full-length door has durable heavy-duty hinges with brass pivots. Foot operated holders lock the doors open, and

provide ample room for pulling cables and making terminations.

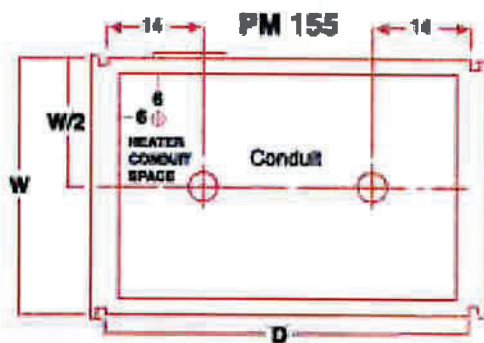
Interruptor switches are maintenance-free and rated at 600 amp. S&C® Power Fuses provide full-fault-spectrum protection. Switches are manually operated by removable switch handles. Bus connections are silverplated copper for long life.

Call today and discuss your requirements with a Park sales representative.

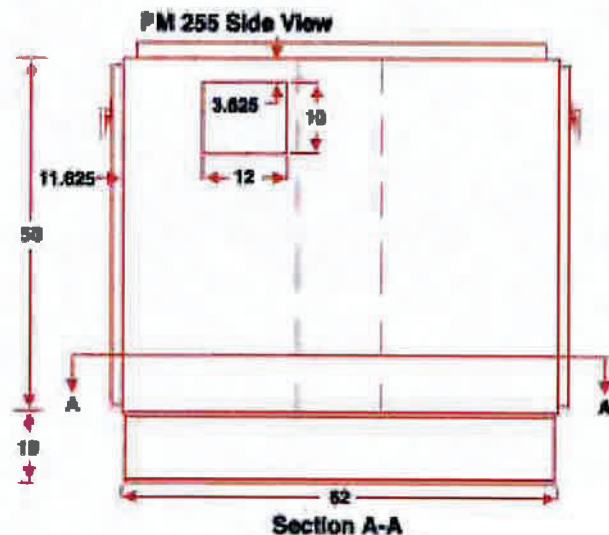
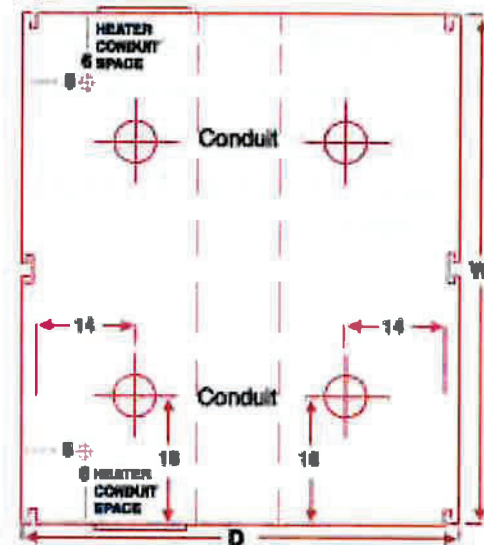
SPECIFICATIONS

Park #	Volts	Height*	Width	Depth
155	15 kv	60	36	52
155	25 kv	65	40	62
255	15 kv	60	72	62
255	25 kv	65	82	72

*Height includes 10" base.



PM 255





POWER DISTRIBUTION SYSTEMS

RELIABLE POWER DISTRIBUTION SYSTEMS FOR EVERY REQUIREMENT

- Busway
- Switchgear
- Switchboards
- Panelboards
- Transformer Enclosures
- Multiple Service Cabinets
- Standard & Custom Enclosures
- Control Panels

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1-800-796-PARK

THREE PHASE PADMOUNT TRANSFORMERS



Short for "Tamper-proof, compartmentalized, liquid-filled, pad mounted transformer", all padmount designs feature fully enclosed tamper-proof terminal compartments and can be supplied with dead-front or live-front configuration, for loop or radial feed applications, with Type II mineral oil, or environmentally friendly and high flash-point Envirotemp™ FR3™.

All new Maddox padmount transformers are constructed of the highest quality materials and built in the US to heavy duty industrial standards, making them ideal for commercial and industrial applications such as data centers, solar step-up, manufacturing facilities, shopping centers, etc. Our padmounts are designed to the latest department of energy efficiency standards built and tested in accordance with industry standards including NEMA, ANSI C.57, DOE, and IEEE as applicable.

With thousands of new units in stock and ready-to-ship, and the manufacturing ability to produce almost any custom design, Maddox stands ready to meet your transformer need(s). Maddox stocks all standard configurations to match most common applications and deliver on short notice.

Design

HV Bushing Config.:

- Dead front or live front
- Loop feed or radial feed

Fluid Options:

- Type II Mineral Oil
- Envirotemp™ FR3™

Standard Gauge/Accessory Package:

- Pressure relief valve
- Pressure vacuum gauge
- Liquid temp & level gauges
- Drain & sample valve
- Adjustment taps

Switch Options:

- 2 Position LBOR Switch
- 4 Position LBOR Switch (V-blade or T-blade)
- (3) 2 Position LBOR Switches

Fusing Options:

- Bayonets w/ isolation links or CLFs

Construction:

- 5-legged core
- Rectangular wound copper or aluminum windings
- Carbon reinforced or stainless steel tank
- Steel divider between HV and LV cabinets
- Penta-head captive bolt

Optional Design Features & Accessories:

- Gauges w/ Contacts
- External drain and sample valve
- Electrostatic Shielding
- Step-up Design
- Surge-Arresters

Available Ratings

Table 1. Typical Transformer Ratings

Sizes (kVA)	45, 75, 112.5, 150, 225, 300, 500, 750, 1000, 1500, 2000, 2500, 3000, 3750, 5000
Frequency	60 Hz or 50 Hz
Cooling Class	ONAN or KNAN
Temp Rise	55°C, 65°C, 55/65°C, 75°C
Voltagess	Available in Δ or Y configuration
600V	208
	240
	416
	480
	600
2.5kv – 5kv	2400
	4160
	4800
15kV	12000
	12470
	13200
	13800
	14400
25kV	20780
	21600
	22900
	24940
35kV	26400
	33000
	34500

Fig 1. Padmount Transformer Outline

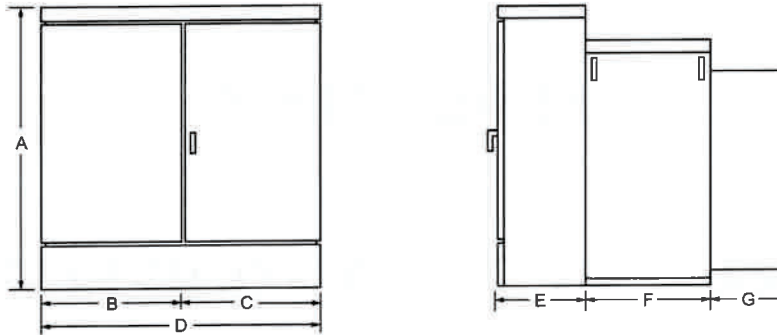


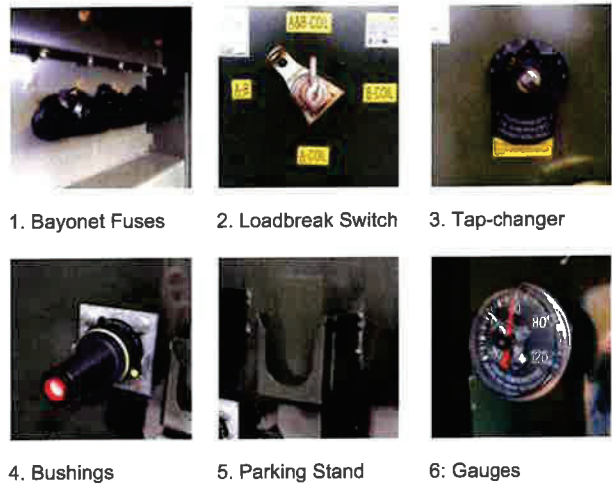
Table 2. Approximate Transformer Dimensions

kVA	A	B	C	D	E	F	G	Gallons	Weight (Lbs)
300	59"	29.5"	22"	51.5"	20.5"	24"	10"	196	4,056
500	59"	33"	26.5"	59.5"	24"	26.5"	10"	210	5,023
750	73"	36"	29"	65"	24"	26.5"	10"	358	7,664
1000	73"	36"	29"	65"	24"	27"	10"	354	8,530
1500	73"	36"	35.5"	71.5"	24"	33.5"	10"	410	10,782
2000	75"	39.5"	28"	67.5"	24"	35"	27"	433	12,490
2500	78"	39.5"	35.5"	75.5"	24"	37.5"	22.5"	545	14,246
3000	84"	30.5"	32"	62.5"	24"	37.5"	38"	550	14,014
3750	75"	50.5"	30"	80.5"	25.5"	42"	38"	730	17,785

Fig 2. Three Phase Maddox Padmount Transformer



Table 3. Common Accessories





565-585w

Draco Module Series

N-TOPCON HIGH EFFICIENCY MONO BM6-16B-G

Bloomberg
NEW ENERGY FINANCE

Tier1



Extraordinary Product Performance

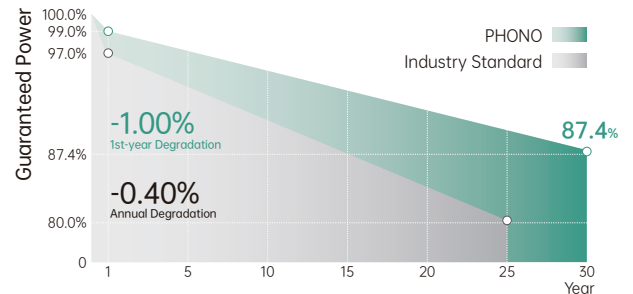
- Up to 30% additional power yield benefited from bifacial technology and up over 80% cell bifaciality
- Competitive high-temperature performance with ameliorated temperature coefficient
- Better weak illumination response, higher power generation with N-TOPCon technology

Higher Quality Reliability

- Zero Light Induced Degradation(LID), can increase power generation
- Industry-leading cell processing technology and dual glass contributes to excellent anti-PID characteristic
- First-year degradation is less than 1.0%, with linear degradation of 0.4% per year for 30 years

Wider Application Conditions

- BIPV, vertical installation, snowfield, high-humid area, windy and dusty area
- Safer and easier handling during transportation and installation



15-year
Product Warranty

30-year
Linear Performance Warranty

MANAGEMENT SYSTEM CERTIFICATES

IEC 61215, IEC 61730, UL 61730

ISO 9001
2015 / Quality management system

ISO 14001
2015 / Standards for environmental management system

ISO 45001
2018 / International standards for occupational health & safety



Electrical Typical Values

Model	1000V	PS565M8GF-24/TNH		PS570M8GF-24/TNH		PS575M8GF-24/TNH		PS580M8GF-24/TNH		PS585M8GF-24/TNH	
	1500V	PS565M8GFH-24/TNH		PS570M8GFH-24/TNH		PS575M8GFH-24/TNH		PS580M8GFH-24/TNH		PS585M8GFH-24/TNH	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	
Rated Power (Pmpp)	565	433	570	436	575	440	580	444	585	448	
Rated Current (Imp)	13.24	10.66	13.30	10.71	13.36	10.76	13.42	10.81	13.48	10.86	
Rated Voltage (Vmpp)	42.68	40.57	42.86	40.74	43.04	40.92	43.22	41.09	43.40	41.26	
Short Circuit Current (Isc)	13.89	11.19	13.95	11.24	14.04	11.31	14.11	11.36	14.18	11.42	
Open Circuit Voltage (Voc)	51.49	49.30	51.73	49.53	51.97	49.98	52.20	50.21	52.44	50.44	
Module Efficiency (%)	21.87		22.07		22.26		22.45		22.65		

STC(Standard Testing Conditions): Irradiance 1000W/m², AM 1.5, Cell Temperature 25°C

NOCT (Nominal Operation Cell Temperature): Irradiance 800W/m², Ambient Temperature 20°C , Spectra at AM1.5, Wind at 1m/s

BSTC

Maximum Power (Pmax)	620	625	630	635	640
Optimum Operating Current (Imp)	14.53	14.58	14.64	14.69	14.75
Optimum Operating Voltage (Vmpp)	42.68	42.86	43.04	43.22	43.40
Short Circuit Current (Isc)	15.24	15.29	15.28	15.33	15.38
Open Circuit Voltage (Voc)	51.49	51.73	52.20	52.44	52.68

BSTC:Front Side Irradiation 1000W/m², Back Side Reflection Irradiation 135W/m² , AM 1.5, Ambient Temperature 25°C

Mechanical Characteristics

Cell Type	N Type Monocrystalline
Dimension (L × W × H)	Length: 2278mm (89.69 inch)
	Width: 1134mm (44.65 inch)
	Height: 30mm (1.18 inch)
Weight	32.0kg (70.55 lbs)
Glass	2.0mm/2.0mm toughened glass
Frame	Anodized Aluminium Alloy
Cable (Including Connector)	12AWG(UL)/4mm ² (IEC), (+): 450mm,(-): 250mm or Customized Length
Junction Box	IP 68 Rated

Temperature Ratings

Voltage Temperature Coefficient	-0.25%/°C
Current Temperature Coefficient	+0.04%/°C
Power Temperature Coefficient	-0.29%/°C
Power Tolerance	0~+3%
NOCT	42±2°C
Bifaciality	80±5%

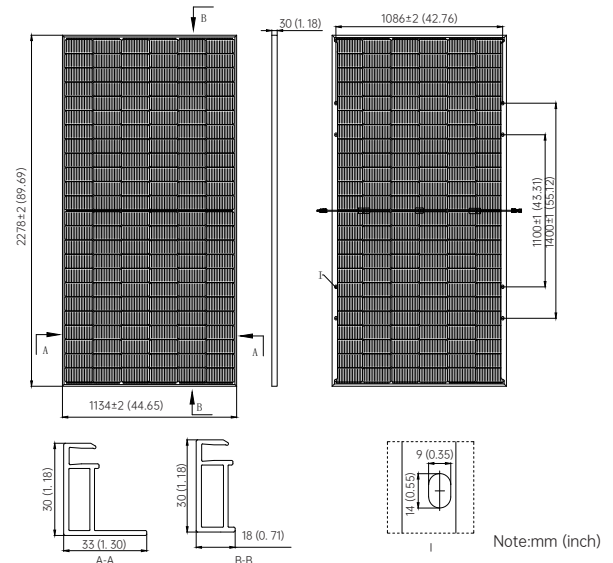
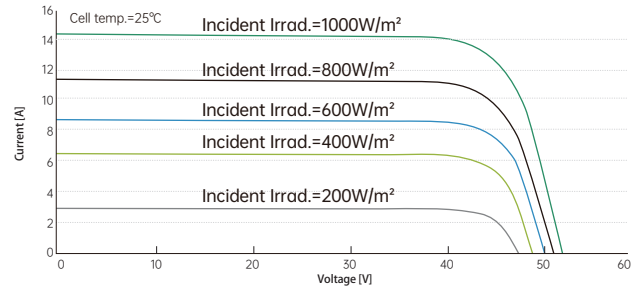
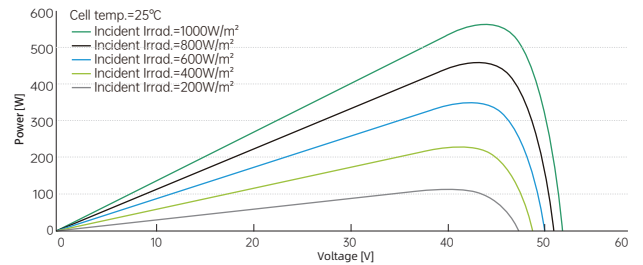
Absolute Maximum Rating

Operating Temperature	From -40 to + 85°C
Hail Diameter @ 80km/h	Up to 25mm
Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Maximum Series Fuse Rating	30A
PV Module Classification	II
Fire Rating (UL61730)	Type29
Maximum System Voltage	DC 1000V/1500V

Packing Configuration

Container	20' GP	40' HQ
Pieces/Container	180	720
Pcs/Pallet	36	36
Pallets/Container	5	20

Electrical Characteristics

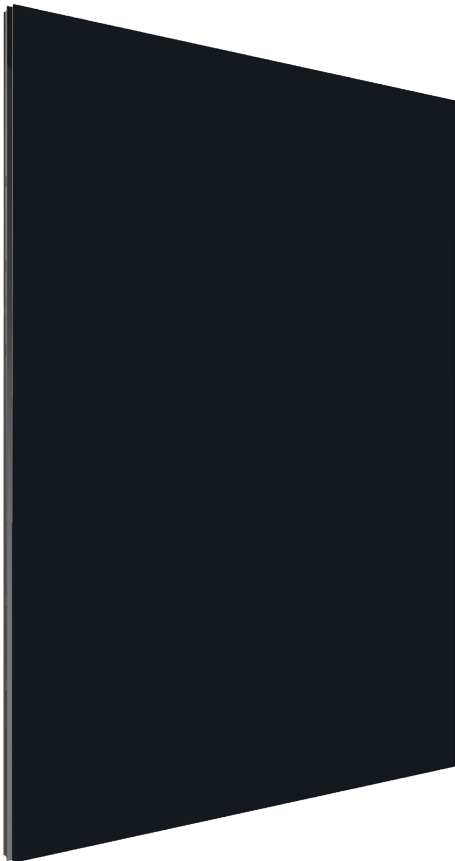




Series 6 *Plus* Bifacial.

455-480 Watt Thin Film Solar Module

First Solar is once again setting the industry benchmark for reliable energy production, optimized design and environmental performance with Series 6 *Plus* Bifacial - the world's first bifacial thin film CdTe module. The advanced design significantly reduces balance of system, shipping, and operating costs while delivering more energy per nameplate watt.



More Lifetime Energy per Nameplate Watt

- Industry's best (0.3%) warranted degradation rate
- Superior temperature coefficient, spectral response and shading behavior
- Unlike crystalline silicon modules, First Solar's thin film technology does not experience losses from LID or LeTID
- Anti-reflective coated glass enhances energy production
- Added bifacial energy yield



Innovative Module Design

- Under-mount frame provides the cleaning and snowshedding benefits of a frameless module while protecting edges against breakage
- Innovative SpeedSlots combine the robustness of bottom mounting with the speed of top clamping while utilizing fewer fasteners to achieve the industry's fastest installation times and lowest mounting hardware costs
- Dual junction box design reduces wire management complexity and cost



Best In-Class Reliability & Durability

- Manufactured under one roof with 100% traceable QA/QC
- Independently tested and certified for reliable performance that exceeds IEC standards in high temperature, high humidity, extreme desert and coastal applications
- Inherently immune to and warranted against power loss from cell cracking
- Durable glass/glass construction



Best Environmental Profile

- Fastest energy payback time in the industry
- Carbon footprint that is 2.5X lower and a water footprint that is 3X lower than mono crystalline silicon panels on a life cycle basis
- Global PV module recycling services available through First Solar or customer-selected third-party

19.0%
HIGH BIN EFFICIENCY

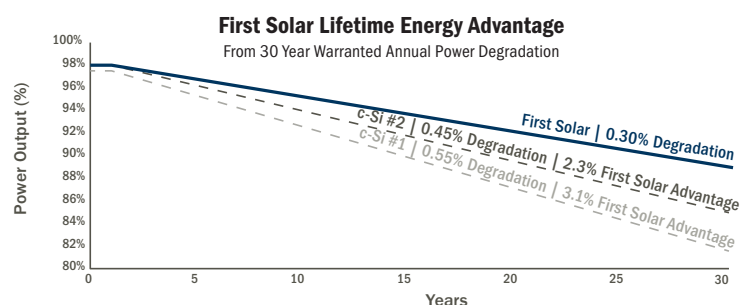
30YR
LINEAR PERFORMANCE
WARRANTY

98%
WARRANTY START POINT

0.3%
WARRANTED ANNUAL
DEGRADATION RATE¹



Learn more about First Solar and Series 6 *Plus* Bifacial at firstsolar.com/S6



Series 6 Plus Bifacial.



Electrical Specifications

RATINGS AT STANDARD TEST CONDITIONS (1000W/m², AM 1.5, 25°C)²

SERIES 6 PLUS BIFACIAL MODEL TYPES: FS-6XXX-P-B / FS-6XXXX-P-B (XXX = NOMINAL POWER)

Nominal Power ³ (-0/+5%)	P _{MAX} (W)	455		460		465		470		475		480	
		STC ⁴	BNPI ⁵	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI	STC	BNPI
Nominal Power	P _{MAX} (W)	455	464	460	469	465	474	470	479	475	485	480	490
Voltage at P _{MAX}	V _{MAX} (V)	187.8	187.8	188.8	188.8	189.8	189.8	191.1	191.1	191.5	191.5	192.8	192.8
Current at P _{MAX}	I _{MAX} (A)	2.42	2.47	2.44	2.49	2.45	2.50	2.46	2.50	2.48	2.53	2.49	2.54
Open Circuit Voltage	V _{OC} (V)	222.0	222.0	222.9	222.9	223.8	223.8	224.3	224.3	224.8	224.8	225.4	225.4
Short Circuit Current	I _{SC} (A)	2.58	2.63	2.59	2.64	2.60	2.65	2.61	2.66	2.61	2.66	2.62	2.67
Efficiency (%)	%	18.1		18.3		18.5		18.7		18.9		19.0	
Maximum System Voltage	V _{SYS} (V)	1500 ⁶											
Limiting Reverse Current	I _R (A)	5.0											
Maximum Series Fuse	I _{CF} (A)	5.0											

TEMPERATURE CHARACTERISTICS

Module Operating Temperature Range	°C	-40 to +85
Temperature Coefficient of P _{MAX}	T _K (P _{MAX})	-0.32%/°C [Temperature Range: 25°C to 75°C]
Temperature Coefficient of V _{OC}	T _K (V _{OC})	-0.28%/°C
Temperature Coefficient of I _{SC}	T _K (I _{SC})	+0.04%/°C
Nominal Operating Cell Temperature	°C	43
Bifaciality Factor	%	15±5

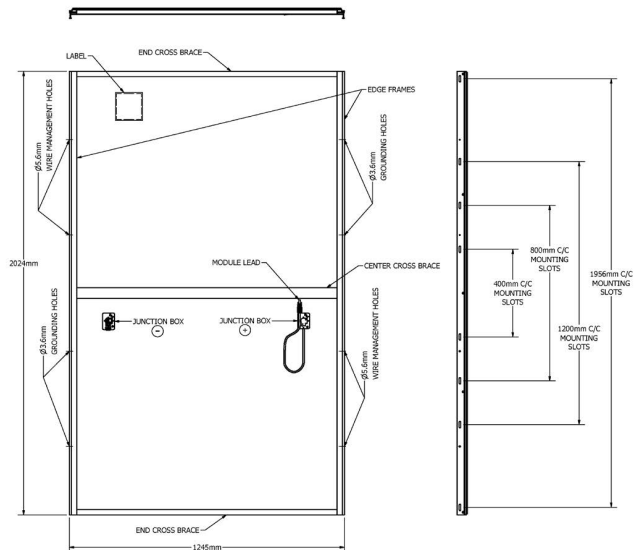
PACKAGING INFORMATION

Model Type	Modules Per Pack	Packs per 40' Container
FS-6XXX-P-B / FS-6XXXX-P-B	27	18

MECHANICAL DESCRIPTION

Module/Glass Length	2024mm/2016mm
Module/Glass Width	1245mm/1216mm
Module/Glass Area	2.52m ² /2.45m ²
Module Weight	34.0kg
Leadwire ⁷	2.5mm ² , 733mm (+) & Bulkhead (-)
Connectors	TE Connectivity PV4-S, or alternate
Junction Box	IP68 Rated
Bypass Diode	N/A
Cell Type	Thin film CdTe semiconductor, up to 268 cells
Frame Material	Anodized Aluminum
Front Glass	Heat strengthened
Back Glass	Heat strengthened
Encapsulation	Laminate material with edge seal
Frame to Glass Adhesive	Silicone
Load Rating ⁸	+/-2400Pa

Mechanical Specifications



Install in portrait only

Certifications & Tests⁹

CERTIFICATIONS AND LISTINGS

IEC 61215:2021 & 61730-1:2016⁶, CE
IEC 61701 Salt Mist Corrosion
IEC 60068-2-68 Dust and Sand Resistance
UL 61730

EXTENDED DURABILITY TESTS

IEC TS 63209-1 Extended Stress Test
Long-Term Sequential
Thresher Test
PID Resistant

QUALITY & EHS

ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
ISO 14064-3:2006
EPEAT Silver Registered

- Limited power output and product warranties subject to warranty terms and conditions
- All ratings ±10%, unless specified otherwise. Specifications are subject to change
- Measurement uncertainty applies
- Frontside electrical ratings
- Bifacial Name Plate Irradiance, as per IEC 61215:2021
- IEC 61730-1: 2016 Class II
- Leadwire length from junction box exit to connector mating surface
- 1500Pa tentative load rating for 1956mm mounting slots. Higher loads may be acceptable, subject to testing
- Testing Certifications/Listings pending

Disclaimer

All images shown are provided for illustrative purposes only and may not be an exact representation of the product. First Solar, Inc. reserves the right to change product images at any time without notice.

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Series 6 Plus TCLP Report

March 21, 2022

1 INTRODUCTION

The purpose of this report is to provide waste characterization of First Solar Series 6 Plus photovoltaic (PV) modules using USEPA Method 1311 Toxicity Characteristic Leaching Procedure (TCLP).

2 METHODS

In February, 2022, First Solar provided three Series 6 Plus modules to Eurofins Calscience laboratory for TCLP testing.

3 RESULTS

TCLP test results are documented in the enclosed laboratory test report and are below the hazardous waste thresholds in Table 1 of 40 CFR 261.24¹.

¹ <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-261/subpart-C/section-261.24>

ANALYTICAL REPORT

Eurofins Calscience
2841 Dow Avenue, Suite 100
Tustin, CA 92780
Tel: (714)895-5494

Laboratory Job ID: 570-85215-1

Client Project/Site: Photovoltaic (PV) Modules - TCLP Metals

For:

First Solar, Inc
28101 Cedar Park Blvd
Perrysburg, Ohio 43551

Attn: Adam Squire



Authorized for release by:
3/17/2022 2:23:03 PM

Rossina Tomova, Project Manager I
(657)210-6367
Rossina.Tomova@Eurofinset.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:

www.eurofinsus.com/Env

The test results in this report meet all 2003 NELAC, 2009 TNI, and 2016 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Definitions/Glossary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD recovery exceeds control limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Job ID: 570-85215-1

Laboratory: Eurofins Calscience

Narrative

Job Narrative 570-85215-1

Comments

No additional comments.

Receipt

The samples were received on 2/17/2022 1:30 PM. Unless otherwise noted below, the samples arrived in good condition. The temperature of the cooler at receipt was 23.0° C.

Receipt Exceptions

The samples were received at the laboratory outside the required temperature criteria for Mercury. There was no cooling media present in the cooler.

Metals

Method 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries of Barium for preparation batch 440-667641 and 440-667772 and analytical batch 440-667873 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.(440-294036-A-22-F MSD)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



Detection Summary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Client Sample ID: OD0-0026-01

Lab Sample ID: 570-85215-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.24		0.10		mg/L	1		6010B	TCLP
Cadmium	0.085		0.050		mg/L	1		6010B	TCLP

Client Sample ID: OD0-0026-02

Lab Sample ID: 570-85215-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.19		0.10		mg/L	1		6010B	TCLP

Client Sample ID: OD0-0026-03

Lab Sample ID: 570-85215-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.14		0.10		mg/L	1		6010B	TCLP

This Detection Summary does not include radiochemical test results.

Eurofins Calscience

Client Sample Results

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Client Sample ID: OD0-0026-01

Lab Sample ID: 570-85215-1

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:36	1
Barium	0.24		0.10		mg/L		02/23/22 17:20	02/24/22 19:36	1
Cadmium	0.085		0.050		mg/L		02/23/22 17:20	02/24/22 19:36	1
Chromium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:36	1
Lead	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:36	1
Selenium	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:36	1
Silver	ND		0.10		mg/L		02/23/22 17:20	02/24/22 19:36	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0025		mg/L		03/15/22 19:30	03/16/22 13:38	1



Client Sample Results

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Client Sample ID: OD0-0026-02

Lab Sample ID: 570-85215-2

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:39	1
Barium	0.19		0.10		mg/L		02/23/22 17:20	02/24/22 19:39	1
Cadmium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:39	1
Chromium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:39	1
Lead	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:39	1
Selenium	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:39	1
Silver	ND		0.10		mg/L		02/23/22 17:20	02/24/22 19:39	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0025		mg/L		03/15/22 19:30	03/16/22 13:43	1



Client Sample Results

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Client Sample ID: OD0-0026-03

Lab Sample ID: 570-85215-3

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:34	1
Barium	0.14		0.10		mg/L		02/23/22 17:20	02/24/22 19:34	1
Cadmium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:34	1
Chromium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:34	1
Lead	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:34	1
Selenium	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:34	1
Silver	ND		0.10		mg/L		02/23/22 17:20	02/24/22 19:34	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0025		mg/L		03/15/22 19:30	03/16/22 13:45	1



QC Sample Results

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 440-667641/1-B
Matrix: Solid
Analysis Batch: 667873

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 667772

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:05	1
Barium	ND		0.10		mg/L		02/23/22 17:20	02/24/22 19:05	1
Cadmium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:05	1
Chromium	ND		0.050		mg/L		02/23/22 17:20	02/24/22 19:05	1
Lead	0.0710		0.050		mg/L		02/23/22 17:20	02/24/22 19:05	1
Selenium	ND		0.20		mg/L		02/23/22 17:20	02/24/22 19:05	1
Silver	ND		0.10		mg/L		02/23/22 17:20	02/24/22 19:05	1

Lab Sample ID: LCS 440-667641/2-B
Matrix: Solid
Analysis Batch: 667873

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 667772

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	2.12		mg/L		106	80 - 120
Barium	2.00	2.12		mg/L		106	80 - 120
Cadmium	2.00	2.03		mg/L		101	80 - 120
Chromium	2.00	2.16		mg/L		108	80 - 120
Lead	2.00	2.09		mg/L		104	80 - 120
Selenium	2.00	1.89		mg/L		95	80 - 120
Silver	1.00	1.06		mg/L		106	80 - 120

Lab Sample ID: 440-294036-A-22-E MS
Matrix: Solid
Analysis Batch: 667873

Client Sample ID: Matrix Spike
Prep Type: TCLP
Prep Batch: 667772

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	ND		2.00	2.19		mg/L		103	75 - 125
Barium	5.4	F1	2.00	7.85		mg/L		121	75 - 125
Cadmium	0.055		2.00	2.09		mg/L		102	75 - 125
Chromium	0.36		2.00	2.53		mg/L		109	75 - 125
Lead	2.1	B	2.00	4.19		mg/L		104	75 - 125
Selenium	ND		2.00	1.85		mg/L		93	75 - 125
Silver	ND		1.00	1.04		mg/L		104	75 - 125

Lab Sample ID: 440-294036-A-22-F MSD
Matrix: Solid
Analysis Batch: 667873

Client Sample ID: Matrix Spike Duplicate
Prep Type: TCLP
Prep Batch: 667772

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	ND		2.00	2.21		mg/L		103	75 - 125	1	20
Barium	5.4	F1	2.00	8.23	F1	mg/L		140	75 - 125	5	20
Cadmium	0.055		2.00	2.08		mg/L		101	75 - 125	1	20
Chromium	0.36		2.00	2.58		mg/L		111	75 - 125	2	20
Lead	2.1	B	2.00	4.36		mg/L		113	75 - 125	4	20
Selenium	ND		2.00	1.91		mg/L		95	75 - 125	3	20
Silver	ND		1.00	1.05		mg/L		105	75 - 125	1	20

QC Sample Results

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 570-219655/1-B
Matrix: Solid
Analysis Batch: 220034

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 219783

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0025		mg/L		03/15/22 19:30	03/16/22 13:32	1

Lab Sample ID: LCS 570-219655/2-B
Matrix: Solid
Analysis Batch: 220034

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 219783

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.0500	0.0529		mg/L		106	80 - 120

Lab Sample ID: LCSD 570-219655/6-B
Matrix: Solid
Analysis Batch: 220034

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 219783

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.0500	0.0530		mg/L		106	80 - 120	0	20

Lab Sample ID: 570-85215-1 MS
Matrix: Solid
Analysis Batch: 220034

Client Sample ID: OD0-0026-01
Prep Type: TCLP
Prep Batch: 219783

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.0500	0.0503		mg/L		101	55 - 133

Lab Sample ID: 570-85215-1 MSD
Matrix: Solid
Analysis Batch: 220034

Client Sample ID: OD0-0026-01
Prep Type: TCLP
Prep Batch: 219783

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.0500	0.0504		mg/L		101	55 - 133	0	20

QC Association Summary

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Metals

Leach Batch: 219655

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	1311	
570-85215-2	OD0-0026-02	TCLP	Solid	1311	
570-85215-3	OD0-0026-03	TCLP	Solid	1311	
MB 570-219655/1-B	Method Blank	TCLP	Solid	1311	
LCS 570-219655/2-B	Lab Control Sample	TCLP	Solid	1311	
LCSD 570-219655/6-B	Lab Control Sample Dup	TCLP	Solid	1311	
570-85215-1 MS	OD0-0026-01	TCLP	Solid	1311	
570-85215-1 MSD	OD0-0026-01	TCLP	Solid	1311	

Prep Batch: 219783

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	7470A	219655
570-85215-2	OD0-0026-02	TCLP	Solid	7470A	219655
570-85215-3	OD0-0026-03	TCLP	Solid	7470A	219655
MB 570-219655/1-B	Method Blank	TCLP	Solid	7470A	219655
LCS 570-219655/2-B	Lab Control Sample	TCLP	Solid	7470A	219655
LCSD 570-219655/6-B	Lab Control Sample Dup	TCLP	Solid	7470A	219655
570-85215-1 MS	OD0-0026-01	TCLP	Solid	7470A	219655
570-85215-1 MSD	OD0-0026-01	TCLP	Solid	7470A	219655

Analysis Batch: 220034

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	7470A	219783
570-85215-2	OD0-0026-02	TCLP	Solid	7470A	219783
570-85215-3	OD0-0026-03	TCLP	Solid	7470A	219783
MB 570-219655/1-B	Method Blank	TCLP	Solid	7470A	219783
LCS 570-219655/2-B	Lab Control Sample	TCLP	Solid	7470A	219783
LCSD 570-219655/6-B	Lab Control Sample Dup	TCLP	Solid	7470A	219783
570-85215-1 MS	OD0-0026-01	TCLP	Solid	7470A	219783
570-85215-1 MSD	OD0-0026-01	TCLP	Solid	7470A	219783

Leach Batch: 667641

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	1311	
570-85215-2	OD0-0026-02	TCLP	Solid	1311	
570-85215-3	OD0-0026-03	TCLP	Solid	1311	
MB 440-667641/1-B	Method Blank	TCLP	Solid	1311	
LCS 440-667641/2-B	Lab Control Sample	TCLP	Solid	1311	
440-294036-A-22-E MS	Matrix Spike	TCLP	Solid	1311	
440-294036-A-22-F MSD	Matrix Spike Duplicate	TCLP	Solid	1311	

Prep Batch: 667772

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	3010A	667641
570-85215-2	OD0-0026-02	TCLP	Solid	3010A	667641
570-85215-3	OD0-0026-03	TCLP	Solid	3010A	667641
MB 440-667641/1-B	Method Blank	TCLP	Solid	3010A	667641
LCS 440-667641/2-B	Lab Control Sample	TCLP	Solid	3010A	667641
440-294036-A-22-E MS	Matrix Spike	TCLP	Solid	3010A	667641
440-294036-A-22-F MSD	Matrix Spike Duplicate	TCLP	Solid	3010A	667641

QC Association Summary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Metals

Analysis Batch: 667873

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-85215-1	OD0-0026-01	TCLP	Solid	6010B	667772
570-85215-2	OD0-0026-02	TCLP	Solid	6010B	667772
570-85215-3	OD0-0026-03	TCLP	Solid	6010B	667772
MB 440-667641/1-B	Method Blank	TCLP	Solid	6010B	667772
LCS 440-667641/2-B	Lab Control Sample	TCLP	Solid	6010B	667772
440-294036-A-22-E MS	Matrix Spike	TCLP	Solid	6010B	667772
440-294036-A-22-F MSD	Matrix Spike Duplicate	TCLP	Solid	6010B	667772

Lab Chronicle

Client: First Solar, Inc
 Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Client Sample ID: OD0-0026-01

Lab Sample ID: 570-85215-1

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			100.20 g	2000 mL	667641	02/22/22 20:17		IRV 2
TCLP	Prep	3010A			5 mL	50 mL	667772	02/23/22 17:20		IRV 2
TCLP	Analysis	6010B		1			667873	02/24/22 19:36	P1R	IRV 2
Instrument ID: ICP8										
TCLP	Leach	1311			100.20 g	2000 mL	219655	02/22/22 20:17		ECL 3
TCLP	Prep	7470A			10 mL	100 mL	219783	03/15/22 19:30	VWJ7	ECL 4
TCLP	Analysis	7470A		1			220034	03/16/22 13:38	VWJ7	ECL 4
Instrument ID: HG7										

Client Sample ID: OD0-0026-02

Lab Sample ID: 570-85215-2

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			101.30 g	2000 mL	667641	02/22/22 20:17		IRV 2
TCLP	Prep	3010A			5 mL	50 mL	667772	02/23/22 17:20		IRV 2
TCLP	Analysis	6010B		1			667873	02/24/22 19:39	P1R	IRV 2
Instrument ID: ICP8										
TCLP	Leach	1311			101.30 g	2000 mL	219655	02/22/22 20:17		ECL 3
TCLP	Prep	7470A			10 mL	100 mL	219783	03/15/22 19:30	VWJ7	ECL 4
TCLP	Analysis	7470A		1			220034	03/16/22 13:43	VWJ7	ECL 4
Instrument ID: HG7										

Client Sample ID: OD0-0026-03

Lab Sample ID: 570-85215-3

Date Collected: 02/09/22 15:00

Matrix: Solid

Date Received: 02/17/22 13:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			100.42 g	2000 mL	667641	02/22/22 20:17		IRV 2
TCLP	Prep	3010A			5 mL	50 mL	667772	02/23/22 17:20		IRV 2
TCLP	Analysis	6010B		1			667873	02/24/22 19:34	P1R	IRV 2
Instrument ID: ICP8										
TCLP	Leach	1311			100.42 g	2000 mL	219655	02/22/22 20:17		ECL 3
TCLP	Prep	7470A			10 mL	100 mL	219783	03/15/22 19:30	VWJ7	ECL 4
TCLP	Analysis	7470A		1			220034	03/16/22 13:45	VWJ7	ECL 4
Instrument ID: HG7										

Laboratory References:

- ECL 3 = Eurofins Calscience Knott, 11380 Knott Street, Garden Grove, CA 92841, TEL (714)895-5494
- ECL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494
- IRV 2 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

Accreditation/Certification Summary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Laboratory: Eurofins Calscience

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10109	09-30-22
California	SCAQMD LAP	17LA0919	11-30-21 *
California	State	2944	09-30-22
Guam	State	21-003R	06-22-22
Nevada	State	CA00111	07-31-22
Oregon	NELAP	CA300001	01-31-23
USDA	US Federal Programs	P330-20-00034	02-10-23
Washington	State	C916-18	10-12-22

Laboratory: Eurofins Calscience

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10256	06-30-22
California	State	2706	06-30-22
Kansas	NELAP	E-10420	07-31-22
Nevada	State	CA015312022-1	07-31-22
Washington	State	C900	09-03-22

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	IRV 2
7470A	Mercury (CVAA)	SW846	ECL 4
1311	TCLP Extraction	SW846	ECL 3
1311	TCLP Extraction	SW846	IRV 2
3010A	Preparation, Total Metals	SW846	IRV 2
7470A	Preparation, Mercury	SW846	ECL 4

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ECL 3 = Eurofins Calscience Knott, 11380 Knott Street, Garden Grove, CA 92841, TEL (714)895-5494

ECL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

IRV 2 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494



Sample Summary

Client: First Solar, Inc
Project/Site: Photovoltaic (PV) Modules - TCLP Metals

Job ID: 570-85215-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
570-85215-1	OD0-0026-01	Solid	02/09/22 15:00	02/17/22 13:30
570-85215-2	OD0-0026-02	Solid	02/09/22 15:00	02/17/22 13:30
570-85215-3	OD0-0026-03	Solid	02/09/22 15:00	02/17/22 13:30

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- 2
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Chain of Custody Record

Client Information Client Contact: Karissa Gordon		Lab PW: Adam Squire E-Mail: karissa.gordon@firstsolar.com		Carrier Tracking No(s): 12 430 69X 03 9356 9815		COC No: Page 1 of 1 Job #:																																										
Address: 28101 Cedar Park Blvd City: Perysburg State Zip: OH 43551 Phone: 419-662-8500 Email: Project Name: Site:		Due Date Requested: TAT Requested (days): PO #: WO #: Project #: SSOW#:		Analysis Requested																																												
<table border="1"> <thead> <tr> <th>Sample Identification</th> <th>Sample Date</th> <th>Sample Time</th> <th>Sample Type (C=Comp, G=grab)</th> <th>Matrix (W=water, S=solid, O=wastefoil, BT=titrate, Anal)</th> <th>Field Filtered Sample (Yes or No)</th> <th>Perform MS/MSD (Yes or No)</th> <th>Total Number of Containers</th> <th>Special Instructions/Note:</th> </tr> </thead> <tbody> <tr> <td>OD0-0026 -01</td> <td>2/9/22</td> <td>3:00 PM</td> <td>COMP</td> <td>SOLID</td> <td>NO</td> <td></td> <td></td> <td></td> </tr> <tr> <td>-02</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>200g (dispersed through)</td> </tr> <tr> <td>-03</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>200g (3 cases)</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>200g</td> </tr> </tbody> </table>		Sample Identification	Sample Date					Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=wastefoil, BT=titrate, Anal)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Total Number of Containers	Special Instructions/Note:	OD0-0026 -01	2/9/22	3:00 PM	COMP	SOLID	NO				-02								200g (dispersed through)	-03								200g (3 cases)							
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=wastefoil, BT=titrate, Anal)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Total Number of Containers	Special Instructions/Note:																																								
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-02								200g (dispersed through)																																								
-03								200g (3 cases)																																								
								200g																																								
Possible Hazard Identification <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/> Radiological Deliverable Requested I, II, III, IV, Other (specify)		Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) <input type="checkbox"/> Return To Client <input checked="" type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months Special Instructions/QC Requirements		Barcode: 570-85215 Chain of Custody																																												
Relinquished by: Karissa Gordon Date/Time: 2/9/22		Relinquished by: First Solar Date/Time: 2/9/22		Relinquished by: Eda Chmelca Date/Time: 2/17/22 1330 Company: Edt																																												
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Custody Seals Intact: Δ Yes Δ No		Cooler Temperature(s) °C and Other Remarks: IR-90 23.5/23.0		Method of Shipment:																																												



Login Sample Receipt Checklist

Client: First Solar, Inc

Job Number: 570-85215-1

Login Number: 85215

List Source: Eurofins Calscience

List Number: 1

Creator: Cruise, Noel

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	Out of temperature for Mercury
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	False	Requested analyses are not listed on COC
Is the Field Sampler's name present on COC?	False	Refer to Job Narrative for details.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-122464-1
Client Project/Site: Solar Module TCLP

For:
SUMEC Energy Holdings Co. Ltd.
No.1 Xinghuo Road
Nanjing Hi-tech Zone
Nanjing, China 210061

Attn: Mr. Chester Chen



Authorized for release by:
12/3/2019 7:25:49 PM

Michael DelMonico, Project Manager I
(330)497-9396
michael.delmonico@testamericainc.com

LINKS

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results through
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www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



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Definitions/Glossary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Job ID: 240-122464-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

CASE NARRATIVE

Client: SUMEC Energy Holdings Co. Ltd.

Project: Solar Module TCLP

Report Number: 240-122464-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, Canton attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The sample was received on 11/18/2019 11:10 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 13.8° C.

TCLP METALS (ICP)

Sample SOLAR PANEL (240-122464-1) was analyzed for TCLP metals (ICP) in accordance with EPA SW-846 Methods 1311/6010B. The sample was leached on 11/25/2019, prepared on 11/26/2019 and analyzed on 11/27/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP MERCURY

Sample SOLAR PANEL (240-122464-1) was analyzed for TCLP mercury in accordance with EPA SW-846 Methods 1311/7470A. The sample was leached on 11/25/2019, prepared on 11/26/2019 and analyzed on 11/27/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
1311	TCLP Extraction	SW846	TAL CAN
3010A	Preparation, Total Metals	SW846	TAL CAN
7470A	Preparation, Mercury	SW846	TAL CAN
Part Size Red	Particle Size Reduction Preparation	None	TAL CAN

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396



Sample Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-122464-1	SOLAR PANEL	Solid	11/14/19 00:00	11/18/19 11:10	

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Detection Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Client Sample ID: SOLAR PANEL

Lab Sample ID: 240-122464-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	4.3		0.050		mg/L	1		6010B	TCLP

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Client Sample Results

Client: SUMEC Energy Holdings Co. Ltd.
 Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Client Sample ID: SOLAR PANEL

Lab Sample ID: 240-122464-1

Date Collected: 11/14/19 00:00

Matrix: Solid

Date Received: 11/18/19 11:10

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 10:08	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Lead	4.3		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:19	1



QC Sample Results

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 240-412722/2-A
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412722

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 09:59	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Lead	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1

Lab Sample ID: LCS 240-412722/3-A
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412722

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Arsenic	2.00	2.15		mg/L		108	50 - 150
Barium	2.00	2.00		mg/L		100	50 - 150
Cadmium	1.00	1.05		mg/L		105	50 - 150
Chromium	1.00	1.01		mg/L		101	50 - 150
Lead	1.00	0.900		mg/L		90	50 - 150
Selenium	2.00	2.13		mg/L		106	50 - 150
Silver	0.100	0.107		mg/L		107	50 - 150

Lab Sample ID: LB 240-412574/1-B
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 412722

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 09:54	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Lead	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1

Lab Sample ID: 240-122464-1 MS
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Arsenic	ND		5.00	5.46		mg/L		109	75 - 125
Barium	ND		50.0	51.9		mg/L		103	75 - 125
Cadmium	ND		1.00	1.12		mg/L		112	75 - 125
Chromium	ND		5.00	5.38		mg/L		108	75 - 125
Lead	4.3		5.00	9.84		mg/L		110	75 - 125
Selenium	ND		1.00	1.14		mg/L		114	75 - 125
Silver	ND		1.00	1.07		mg/L		107	75 - 125

QC Sample Results

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 240-122464-1 MSD
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412722

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	%Rec.	RPD	Limit
	Result	Qualifier	Added	Result	Qualifier				Limits		
Arsenic	ND		5.00	5.59		mg/L		112	75 - 125	2	20
Barium	ND		50.0	54.0		mg/L		108	75 - 125	4	20
Cadmium	ND		1.00	1.14		mg/L		114	75 - 125	2	20
Chromium	ND		5.00	5.43		mg/L		109	75 - 125	1	20
Lead	4.3		5.00	9.95		mg/L		112	75 - 125	1	20
Selenium	ND		1.00	1.16		mg/L		116	75 - 125	2	20
Silver	ND		1.00	1.09		mg/L		109	75 - 125	2	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-412725/2-A
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412725

Analyte	MB	MB	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:15	1

Lab Sample ID: LCS 240-412725/3-A
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412725

Analyte	Spike	LCS	LCS	Unit	D	%Rec	%Rec.
		Result	Qualifier				Limits
Mercury	0.00500	0.00549		mg/L		110	80 - 120

Lab Sample ID: LB 240-412574/1-D
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 412725

Analyte	LB	LB	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:13	1

Lab Sample ID: 240-122464-1 MS
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412725

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	%Rec.
	Result	Qualifier	Added	Result	Qualifier				Limits
Mercury	ND		0.00500	0.00564		mg/L		113	80 - 120

Lab Sample ID: 240-122464-1 MSD
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412725

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	%Rec.	RPD	Limit
	Result	Qualifier	Added	Result	Qualifier				Limits		
Mercury	ND		0.00500	0.00563		mg/L		113	80 - 120	0	20

QC Association Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Metals

Processed Batch: 412195

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	Part Size Red	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	Part Size Red	
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	Part Size Red	

Leach Batch: 412574

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	1311	412195
LB 240-412574/1-B	Method Blank	TCLP	Solid	1311	
LB 240-412574/1-D	Method Blank	TCLP	Solid	1311	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	1311	412195
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	1311	412195

Prep Batch: 412722

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	3010A	412574
LB 240-412574/1-B	Method Blank	TCLP	Solid	3010A	412574
MB 240-412722/2-A	Method Blank	Total/NA	Solid	3010A	
LCS 240-412722/3-A	Lab Control Sample	Total/NA	Solid	3010A	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	3010A	412574
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	3010A	412574

Prep Batch: 412725

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	7470A	412574
LB 240-412574/1-D	Method Blank	TCLP	Solid	7470A	412574
MB 240-412725/2-A	Method Blank	Total/NA	Solid	7470A	
LCS 240-412725/3-A	Lab Control Sample	Total/NA	Solid	7470A	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	7470A	412574
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	7470A	412574

Analysis Batch: 412928

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	6010B	412722
LB 240-412574/1-B	Method Blank	TCLP	Solid	6010B	412722
MB 240-412722/2-A	Method Blank	Total/NA	Solid	6010B	412722
LCS 240-412722/3-A	Lab Control Sample	Total/NA	Solid	6010B	412722
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	6010B	412722
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	6010B	412722

Analysis Batch: 413058

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	7470A	412725
LB 240-412574/1-D	Method Blank	TCLP	Solid	7470A	412725
MB 240-412725/2-A	Method Blank	Total/NA	Solid	7470A	412725
LCS 240-412725/3-A	Lab Control Sample	Total/NA	Solid	7470A	412725
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	7470A	412725
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	7470A	412725

Lab Chronicle

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Client Sample ID: SOLAR PANEL

Lab Sample ID: 240-122464-1

Date Collected: 11/14/19 00:00

Matrix: Solid

Date Received: 11/18/19 11:10

<u>Prep Type</u>	<u>Batch Type</u>	<u>Batch Method</u>	<u>Run</u>	<u>Dilution Factor</u>	<u>Batch Number</u>	<u>Prepared or Analyzed</u>	<u>Analyst</u>	<u>Lab</u>
TCLP	Processed	Part Size Red			412195	11/22/19 08:42	POP	TAL CAN
TCLP	Leach	1311			412574	11/25/19 16:55	DRJ	TAL CAN
TCLP	Prep	3010A			412722	11/26/19 14:00	MRL	TAL CAN
TCLP	Analysis	6010B		1	412928	11/27/19 10:08	WKD	TAL CAN
TCLP	Processed	Part Size Red			412195	11/22/19 08:42	POP	TAL CAN
TCLP	Leach	1311			412574	11/25/19 16:55	DRJ	TAL CAN
TCLP	Prep	7470A			412725	11/26/19 14:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	413058	11/27/19 18:19	SLD	TAL CAN

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

Accreditation/Certification Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Laboratory: Eurofins TestAmerica, Canton

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
California	State Program	2927	02-23-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
7470A	7470A	Solid	Mercury



13.1/13.8
SUMEC

SUMEC ENERGY HOLDINGS CO.,LTD.
 江苏苏美达能源控股有限公司

致TO Eurofins TestAmerica
 4101 Shuffel Street NW, North Canton, OH 44720, USA

发票编号 INV.NO. SUMEC-EUROFINS-20191114
 日期 DATE 2019/11/14

发 票
COMMERCIAL INVOICE

L/C NO.

唛头及编号 Mark && Numbers	品名 Descriptions	数量 Quantities	单价 Unit Price	总价 Amount
N/M	raw material sample of solar module	2 SET	USD 5.00	USD 10
		2 SET		10.00

TOTAL:PACKED IN: 1 CARTON
 G/W: 1 KGS
 N/W: 0.9 KGS

SUMEC ENERGY HOLDINGS CO.,LTD.
 NO.1 XINGHUO ROAD, NATIONAL LEVEL NANJING
 HI-TECH ZONE, NANJING, 210061 P.R. CHINA

江苏苏美达能源控股有限公司
 SUMEC ENERGY HOLDINGS CO.,LTD

王健

Accepted by Lab 11/18/19
 TAC/ETA 1110



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Eurofins TestAmerica Canton Sample Receipt Form/Narrative Login # : 122464
Canton Facility


Client Sumec Energy Holdings Inc Site Name _____ Cooler unpacked by: Ryan Criddle
 Cooler Received on 11-18-19 Opened on 11-18-19 1110
 FedEx: 1st Grd Exp UPS FAS Clipper ~~Client Drop Off~~ TestAmerica Courier Other DHL

Receipt After-hours: Drop-off Date/Time _____ **Storage Location** _____

TestAmerica Cooler # _____ Foam Box _____ Client Cooler Box Other _____
 Packing material used: Bubble Wrap _____ Foam Plastic Bag None _____ Other _____
 COOLANT: Wet Ice _____ Blue Ice _____ Dry Ice _____ Water None

1. Cooler temperature upon receipt See Multiple Cooler Form
 IR GUN# IR-10 (CF +0.7°C) Observed Cooler Temp. 13.1 °C Corrected Cooler Temp. 13.8 °C
 IR GUN #IR-11 (CF +0.9°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
 -Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
 -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
 -Were tamper/custody seals intact and uncompromised? Yes No NA

3. Shippers' packing slip attached to the cooler(s)? Yes No
 4. Did custody papers accompany the sample(s)? Yes No
 5. Were the custody papers relinquished & signed in the appropriate place? Yes No
 6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
 7. Did all bottles arrive in good condition (Unbroken)? Yes No
 8. Could all bottle labels be reconciled with the COC? Yes No
 9. Were correct bottle(s) used for the test(s) indicated? Yes No
 10. Sufficient quantity received to perform indicated analyses? Yes No
 11. Are these work share samples? Yes No
 If yes, Questions 12-16 have been checked at the originating laboratory.
 12. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# HC995364
 13. Were VOAs on the COC? Yes No
 14. Were air bubbles >6 mm in any VOA vials? Yes  Larger than this. Yes No NA
 15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes No
 16. Was a LL Hg or Me Hg trip blank present? Yes No

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____
 Concerning _____

Tests that are not checked for pH by Receiving:
 VOAs
 Oil and Grease
 TOC

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by: _____

Will log ID as "Solar Panel" sample date w/ 11/14/19 (date at top of COC/letter), no sample time. Will log TCLP Metals w/ PSR per PM.

18. SAMPLE CONDITION
 Sample(s) _____ were received after the recommended holding time had expired.
 Sample(s) _____ were received in a broken container.
 Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION
 Sample(s) _____ were further preserved in the laboratory.
 Time preserved: _____ Preservative(s) added/Lot number(s): _____
 VOA Sample Preservation - Date/Time VOAs Frozen: _____