



TURN-KEY 20 MEGAWAT SOLAR PANEL ASSEMBLY LINE OFFERING

OBJECT: COMMERCIAL OFFER FOR A SEMI-AUTOMATIC TURN KEY SUPPLY FOR A 20 MWp PHOTOVOLTAIC MODULE PRODUCTION LINE CONSIDERING 3 SHIFTS OF 8 HRS - REF. LAY OUT 2015-43

The following provide information on a complete production line for the production of photovoltaic modules. The manufacturer offers customers complete turn-key production lines, with support, start-up, maintenance and advice service by qualified personnel with years of experience.

The machines are of the newest generation and innovative for the use of thin photovoltaic crystalline cells with large dimensions. The gathering of the machines creates a complete line for the production of high quality photovoltaic modules in accordance with the European and UL standards (ISO 9001) and in accordance with the certificates requested by the market.

The offered line is not only for standard photovoltaic modules but also for BIPV – Building Integrated PV modules thanks to its high flexibility.

The maximum string length in the stringer machine is 2 meters and the maximum cell to cell distance is 50 mm, but this can be customized on request. The laminator releases the membrane with controlled pressure and speed which optimize the lamination of glass-glass modules.

The manufacturer equips the machines with Ethernet connection that permits a remote supervision and quick assistance. In this way, the machines are already pre disposed to be interfaced in a automatic line and with a possible management software of the line.

INFORMATION ABOUT THE PROJECT:

Cell Type	: 6" poly - 4,43 Wp thickness 160 -micron - without T.L. 253 W / module
Yearly working days	: 330
Daily working hours	: 24 (3 shifts)
Workers	: 6 operators + 1 shift leader per production shift (Warehouse excluded)
soldering capacity considered	: 700 cells / hour x stringer machine
Total plant capacity (100% UPTIME)	: 23 MWp/YEAR
Yearly capacity considering 95% production yield	: 21,87 MWp/YEAR - 72.900 modules size 72 cells/year (300 Wp)

FACILITY REQUIREMENTS:

Production area	: 528 sqm (12 x 44 m)
Warehouse area	: Min. 500 sqm
Power consumption (Production area)	: 155 kW – Installed peak power, average power consumption is circa 40 % of the installed peak power.
Air compressor	: Motor size 15 kW, 8 Bar, 1000 liters
Temperature	: 18°C-25°C
Humidity (production)	: 50 to 70 %
Humidity (storage)	: Below 50 % (specially for EVA)
Floor loading capacity	: 800 kg / sqm
Production floor height	: 3 meters (in case of buffers / robot 6 meters)

LIST OF EQUIPMENT FOR A 20 MW PRODUCTION LINE

POS EQUIPMENT:

1 ETS700 TABBER AND STRINGER MACHINE

Stringer machine mod. ETS700 able to solder and tab all type of square and pseudo square solar cells 156x156 mono crystalline and poly crystalline 3 and 4 bus bars . The standard soldering system is a combination of contact and hot air that solders the complete surface of the ribbon. The machine is equipped with double cell loading baskets to avoid production stops when loading new cells. Maximum string length 2 meters. The machine is supplied with internet assistance and embedded PC.

Soldering top speed 700 cells / hour.

The machine is supplied with following accessories:

KIT 3 BB including:

1 ribbon guide for 3 bb cells, inter axis 52 mm for 1.7mm ribbon.

1 soldering head for 3 bb cells 156 x 156 mm inter axis of 52 mm.

KIT 4 BB including:

1 ribbon guide for 4 bb cells, inter axis 39 mm for 1.3 mm ribbon.

1 soldering head for 4 bb cells 156 x 156 mm inter axis of 39 mm.

Kits for cut cell processing available as option

Q.TY

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POS EQUIPMENT:

2 ECOLAY-UP 100

ECOLAY-UP 100 is a machine designed to simplify the lay-up of the strings on the glass. ECOLAY-UP 100 picks up and positions the strings coming out from the stringers on the glass with encapsulant material. A load arm, with the help of vacuum, picks up the strings and turns them clockwise or anti clockwise before positioning them. The glass enters in the machine on a motorized conveyor belt. The number of strings per glass is settable from the touch screen and when the module is ready it's automatically unloaded.

String alignment and soldering of the head connections are performed manually.

Q.TY

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POS EQUIPMENT:

3 LIGHT TABLE

Light Table for head connection soldering equipped with two complete soldering stations. The diffused light helps the operators to perform the soldering of the head connections optimizing the alignment of the strings and speeding the operation. Dim: 2000x2200 mm.

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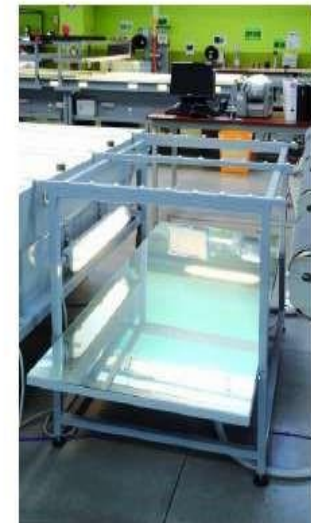
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4 INSPECTION TABLE WITH MIRROR

Inspection table with mirror equipped with a manual voltage control before lamination that permits to check the continuity and the correct polarization of the strings. The mirror permits a fast and accurate inspection of the alignment of the strings and visual inspection of eventual broken cells. Dim 2000x1100 mm

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POS EQUIPMENT:

Q.TY

5 ECOLAM 06 WITH LOAD AND UNLOAD BELTS - 3 Modules per cycle

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Automatic laminator for photovoltaic modules with a lamination area of 3250 x 2100 mm.

Uniform gel content of the laminated EVA guaranteed. The laminator is suitable also for producing glass-glass modules (2+2 mm; 3,2+3,2mm and more). Automatic release sheet in Teflon on both module sides in lamination.

Quick change system of the silicone membrane with clamps around the external borders of the laminator which makes it possible to change the membrane in less than 30 minutes and the change can be performed with the plates in working temperature. Long life of the membrane guaranteed (Min.3000 Cycle).

A special designed external pump housing includes an oil pump and a special condensation filter that absorbs the gasses formed during the lamination process in order to not damage the pump and to not let out this gas in the environment. The machine is supplied with internet connection for assistance and supervision

A booster pump is installed in the laminator.



6 TRIMMING STATION

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Turnable table with blocking system. The edge trimming is done manually.



POS EQUIPMENT:

7 ECOFRAME HORIZONTAL - IN LINE AUTOMATIC LOAD & UNLOAD

Suitable for silicone and tape framing;

Frame punching on long side for module dimension within the range of 1.000 to 2.000 mm;

Framing machine for corner key framing; Not designed for screw framing.

Automatic load and unload of the module with conveyors.

Manual load of the aluminium frame. Minimum module dimension 650 x 930 mm

Maximum module dimension 2000 x 1300 mm

The machine is equipped to frame 1 module size as standard but other sizes within the range of the minimum and maximum dimension are available as optional

Q.TY

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8 ECOSIL 14

ECOSIL 14 is a machine designed for distribute equally the right quantity of silicone into the aluminum frame. The machine is loading automatically the frame ready for the installation. Automatic silicone dispenser for neutral silicone drums of 19.5 kg.

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POS EQUIPMENT

9 SUN SIMULATOR ECOSUN PLUS

The Sun Simulator represents a new generation of sun simulators thanks to the use of LED as the light source.

1. Triple class A+ (uniformity 1% spectrum AM) 1.5 and stable luminosity 1000 W /m2)
2. No recharging time between the tests;
3. Long pulse capabilities: 2 -5s;
4. Possibility to personalize the pulse up to 30s and more;
5. Calibrated pyranometer for irradiance measurements;
6. Compact dimensions;
7. Precise Electronic load for characterization of the module with customized I-V range;
8. Sensor to measure the module and the environment temperature;
9. Uniformity constant over LED source lifetime;
10. 2 x 1.2 m illuminated area;
11. LED source life time more than 20 Million pulses;
12. Inline work height 1560 mm;
13. SQL database for data storage;
14. RFID compatible

OPTIONAL AVAILABLE:

Automatic load/unloading system; Automatic contract system;
Customized electronic load; Light soaking capability; Bigger/smaller illuminated area; Extended spectrum range

Q.TY

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POS EQUIPMENT:

10 HI-POT TESTER

In order to guarantee a long life of the photovoltaic module and the safety of the installation, Ecoprogetti offers an instrument which controls the electrical insulation of the modules during the production process in respect of the norm IEC 61215/61730. The instrument permits to perform the Hi-Pot test with a maximum voltage of 6kV DC

Q.TY

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11 ECOLAB EL 103 - ELECTRO-LUMINESCENCE TESTER AFTER SUN SIMULATOR

ECOLAB EL 103 is a machine for the Electroluminescence quality test with following specifications:

- Manual load, unload and contacting
- Panel condition:
 - for laminated module
- Max panel size: 2000x1000
- Working area: 2080x1080
- 2 cameras 4MPx each
- max resolution: 0.55 mm/px
- Resolution for a complete module of 60 cells: 5.4Mpx;
- Resolution for a complete module of 72 cells: 6.6Mpx;
- Exposition time: from 1s to 10s per snap;
- Acquisition time for a complete module: less than 20s
- Inline work height 1000 mm

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POS EQUIPMENT:

12 ECOCUT 01

Automatic ribbon cutting machine.

This machine is used to cut the bus ribbon to a pre-set measure.

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13 ECOCUT 10

Semi-Automatic EVA and back sheet cutter. The width of the sheet is adjustable up to 1100 mm and the max length is settable up to 2000 mm. Maximum material spool diameter 300 mm. The machine is supplied with internet assistance.

Automatic incision in the foil for the ribbon is available as option

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POS EQUIPMENT:

14 ECOKIT COMPOSED BY:

- A) Nr. 1 string reparation table complete with manual soldering station
- B) Nr. 3 Support wagon for cut Eva and back sheet
- C) Nr. 3 Support for laminates
- D) Nr. 2 Wagon with turnable wheels which can load up to 12 modules to be laminated
- E) Nr. 1 suitcase with tools for the maintenance;
- F) Nr. 8 soldering station
- G) Nr. 1 Thermal Printer for bar code and back labels
- H) Nr. 10 Pattern to help operator to perform perfect soldering of head connections
- I) Nr. 2 Manual bench for the application of the junction box
- J) Kit for the application of Silicone in JB (gun + support + pipe)
- K) Nr. 2 Manual load bench for the loading/unloading of the Sun simulator
- L) Nr. 2 Free roller tables
- M) Tools for production for the operators

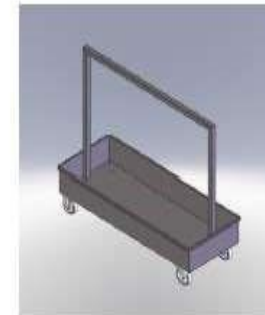
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A



B



C



D



E



F



G



H



I



J



K



L



M



POS SERVICES:

15 INSTALLATION

Estimated time 15 days for 2 technicians means 1 week for installation and 1 week of productions training. All travelling expenses such as tickets, board and lodging to be paid by the Buyer.

The Buyer is responsible to prepare the factory with electrical and pneumatic supply according turnkey assembly plant manufacturer's instructions and to have all necessary raw material for the install and start up ready fo the arrival of the technicians.

Q.TY

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POS SERVICES:

16 TRAINING

The Manufacturer offers 2 weeks of training for 2 persons at the manufacturing facility.
The training is performed on the machines and on the entire production process.
Travelling and lodging expenses are at the customers's charge.



Q.TY

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17 REMOTE ASSISTANCE

50 hours package for remote assistance.
The hours under guarantee will not be charged.



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18 KIT OF SPARE PARTS

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19 SEA WORTHY PACKAGING

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TOTAL PRICE FOR TURN-KEY SUPPLY INCLUDING SERVICES IN EURO

2,500,000.00 USD

*The final price can slightly vary according to the needed voltage of the place of installation (standard 400 V + 3P + N).
The equipment are predisposed to work in 400 V + 3P + N and if a different voltage is required it will be discussed if to
implement transformers or to modify the electrical board of the machines.
This depends on the voltage criteria of the place of installation.

**Photos used in the present offer are for illustrative purpose only and esthetical aspect can be subjected to change without further notification.*

LINE UPGRADE FROM 20 TO 40 MW ON 3 SHIFTS AND 300 YEARLY WORKING DAYS WITH THE ADDITION OF THE FOLLOWING EQUIPMENT:

EQUIPMENT REQUIRED FOR UPGRADE:

QTY:

ETS700 TABBER AND STRINGER MACHINE

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FREE ROLLER TABLE

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INSPECTION TABLE WITH MIRROR

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FREE ROLLER TABLE FOR LAMINATOR CONNECTION

2

ECOLAM 06 WITH LOAD AND UNLOAD BELTS

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UNLOADING FREE ROLLER TABLE

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TRIMMING STATION

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INSTALLATION

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TOTAL PRICE FOR LINE UPGRADE TO INCREASE THE PRODUCTION CAPACITY TO 40 Mw

\$585,000.00 USD

OPTIONAL EQUIPMENT:

POS EQUIPMENT:

OP1 ECOLAB EL 102- ELECTRO-LUMINESCENCE TESTER BEFORE LAMINATION

UNIT PRICE	Q.TY	TOTAL PRICE
\$88,600.00 USD	1	\$88,600.00 USD

ECOLAB EL 102 is a machine for the Electroluminescence quality test with following specifications:

- Manual load, unload and contacting
- Panel condition:
- interconnected strings
- for not laminated modules
- Max panel size: 2000x1000
- Working area: 2080x1080
- 2 cameras 4MPx each
- max resolution: 0.55 mm/px
- Resolution for a complete module of 60 cells: 5.4Mpx;
- Resolution for a complete module of 72 cells: 6.6Mpx;
- Exposition time: from 1s to 10s per snap;
- Acquisition time for a complete module: less than 20s
- Inline work height 1000 mm



POS EQUIPMENT:

OP2 GLASS WASHER

Glass washing machine with following characteristics :

Usable glass width 1100 mm.

Minimum glass dimensions 500 x 500 mm, Glass thickness from 3 to 8 mm.

Washing section composed by: - washing with 2 sets of cylindrical brushes – rinsing – drying with 3 fans.

Loading and unloading belts. Work speed from 1 to 4 meters / minute. Water consumption ca 60 litre / hour

UNIT PRICE	Q.TY	TOTAL PRICE
	1	\$62,500.00 USD



OP3 KIT FOR CUT CELL PROCESSING

Kits for cut cell processing are available as option of the stringer machine for the following sizes :

156 x 104 mm

156 x 78 mm

156 x 52 mm

UNIT PRICE	Q.TY	TOTAL PRICE
	1	\$6,150.00 USD
	1	\$6,150.00 USD
	1	\$6,150.00 USD
	1	\$63,900.00 USD

OP4 LASER SCRIBING MACHINE

Laser scribing machine for solar cells with manual loading and unloading

Laser wavelength : 1064 nm; Laser max output power : <50 W

Laser repeat frequency : 1 KHz - 50 KHz

Worktable moving speed : > 80 mm/s; Scribing width : < 0,05 mm

Cutting thickness : < 1,2 mm ; Worktable journey : 320 x 320 mm

Worktable size : 350 x 350 mm²; Power supply : 3φ/ 380V/ 50Hz /5.5KW

Cooling way : Integration constant temperature circulation water cooling

Laser chiller power : 1.0 KW; Rating flow : 33,3 L / min;

Rating pump distance : 35 m



GENERAL SUPPLY CONDITIONS

DELIVERY TERMS:

EX Builder's Port

DELIVERY TIME:

3 months of order and first payment

WARRANTY:

12 months from the date of inspection or in any case not longer than 14 months from date of official transport documents.

PAYMENT TERMS:

Buyer's Proof of Funds for total cost of order must be verified and confirmed 30 days prior to dispatch. Confirmation charges to be paid by the Buyer.

40% at order as non-refundable down payment

Remaining amount irrevocable and confirmed

50% of order amount to be paid at sight against presentation of Bill of Lading

10% of order amount to be paid at sight against presentation of the installation report or in any case at 60 days date of Bill of Lading. Whichever is earlier.

Bank Details:

Banking Details will be furnished by PPPI upon: 1) the positive approval by the USA's Department of Treasury for PPPI to export agricultural and sustainable energy products from the solar, wind, hydro, and fuel cell fields and their ancillary balance of systems components that grow food for livestock and human consumption, provide electricity, pump water, treat/purify water, and illuminate roads and common areas. 2) the positive approval by the USA's Department of Treasury for PPPI to deliver consultation services and design and deliver workforce development training in the aforementioned industries.

INSTRUCTIONS:

Instruction and maintenance manuals are supplied in English and second. Other languages are also an option.

LAW IN FORCE:

In case of a positive outcome of the present offer, the supply will be subjected to the laws and court of the supplier.

OFFER VALIDITY:

2 months from date of present offer

GENERAL WARRANTY CONDITIONS

The warranty period on the Supplier's machines is 12 months from date of successful installation or in any case not longer than 14 months from date of official transport documents. The Supplier guarantees that all machines and material supplied by the installer are constructed only by material of finest quality.

The warranty does not cover defects and/or malfunctions caused by inexperience and operating errors or by inadequate maintenance and normal corrosion and wear and tear.

Parts that are found defective during the warranty period, will be repaired / replaced free of charge. The Customer will hand over the faulty parts to the builder. If the defect is of such a nature that it requires a reparation at the location of the machine, the costs for the travel, accommodation, local transport and work hours for the supplier's personnel shall be paid by the builder. If the defect is caused by improper use, inexperience, operating errors and/or inadequate/missing maintenance, all concerning costs and expenses will be calculated on the basis of the current standard rates and charged to the Customer. The reason of the defect will be settled by the Supplier's technicians.

All consumable parts are excluded from the warranty.

THE WARRANTY SHALL BE CONSIDERED CANCELLED IF ANY OF BELOW EVENTS OCCUR:

- The instructions of the machine's instruction and maintenance manual are not Strictly adhered to.
- Any modification is made without the prior authorization of the builder.
- The programmed and/or ordinary maintenance is neglected;
- Maintenance and operation is performed by unauthorized personnel;
- The machine is used in a different manner than what is prescribed
- If spare parts and / or consumable parts, that haven't been approved by the builder, are installed or used in the machines.

GENERAL DELIVERY CONDITIONS

If the ordered machines cannot be delivered and installed with the the time establishe with an offer, for reason caused by the Buyer, the payme of 60% must in any case be done within 30 days after the communication from the turnkey manufacturer that the machines are ready for acceptance test and delivery.

The ownership of the equipment remains with the manufacturer until the complete payment has been done.

The machines contain a memory-control date for the first three months of work. This memory - when full - blocks te machine, whch mut be restored by the manufacturer's technicians (free of charge).

Contact:

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