IDS Énergie and PVavenue Inc. proudly present

100kW solar plant kit

for one-stop turn-key solution

Weather conditions in Québec

Case study: Trois-Rivières

✓ **Location**: 46°3’ N, 72°5’ W

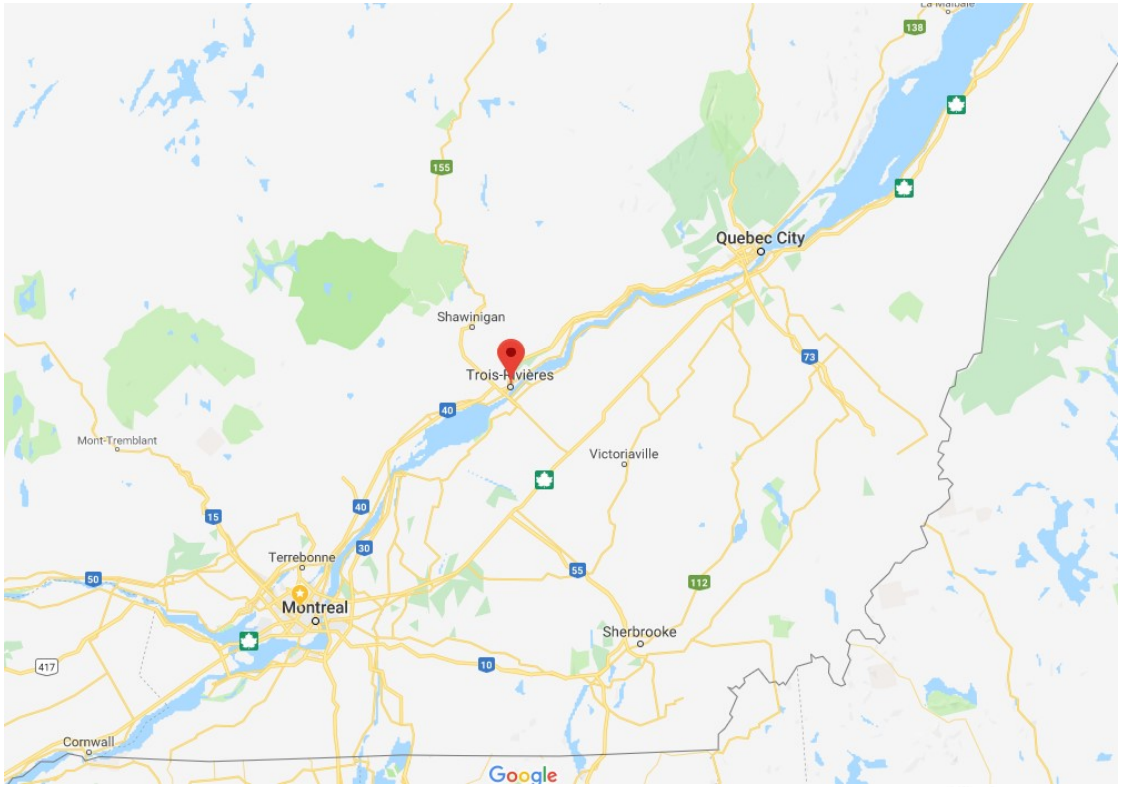
✓**Climate Zone**: Cold - Humid

✓ **Ave. air temperature**: 6.3 °C

✓ **Rel. humidity** : 73.1 %

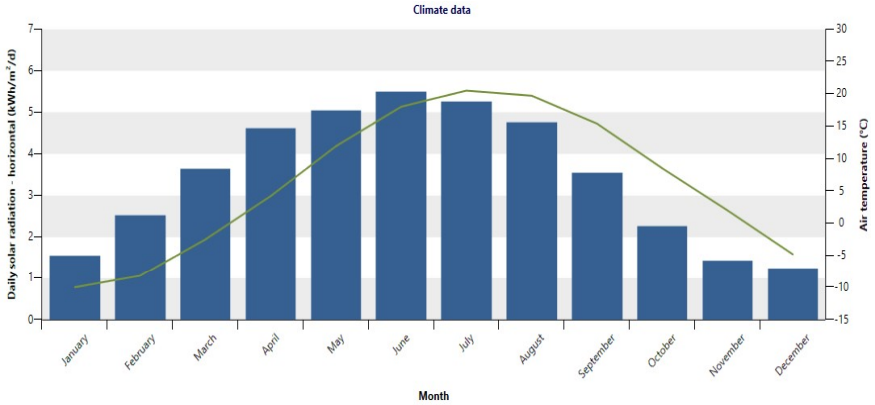
✓ **Precipitation**: 1 107 mm

✓ **Wind speed**: 3.9 m/s (8.8 mph)
(Extreme wind speed up to 27 m/s
(= 61 mph = 98km/h) in 2009)



Solar PV potential in Trois-Rivières

✓ Solar irradiation and air temperature



✓Daily solar irradiation (horizontal)
: 3.46 kWh/m^2/day → 3.5 Sun hours/day

✓Relatively cool temperature (< 20° C) in summer season → ideal for PV electricity production in summer season

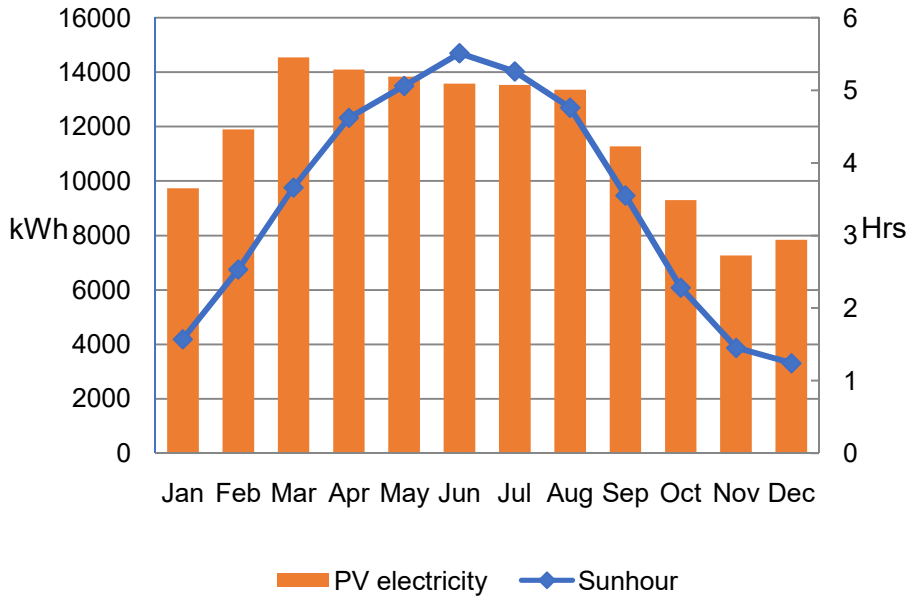
✓ Precipitation and wind speed

✓Precipitation all the year round
: cleaning/cooling effects
: snow mitigation solution needed in winter season (optimal tilt angle required for snow sliding-off)

✓Mild wind speed (<4.5 m/sec)

Prediction of PV electricity production for 100kW solar PV

✓ **Simulated PV electricity production for 100 kW system in Trois-Rivières**
(Ground-mount installation at 40° tilt angle and 0° azimuth (South) and inverter efficiency of 95%)



Annual production of 140 301 kWh for 100 kW solar PV system in Trois-Rivières !

→ Monthly average of 11 688 kWh PV electricity production

→Equivalent to a saving up to yearly 12 627 $ at a rate of 0.09 $/kWh.

100kW solar PV plant kit

✓Components

- Solar Module: **SHINSUNG** mono 72c, 350W x 288 pc (=100.8 kWp in total)
- Inverter: **ABB** String inverter 50KW x 2 pc
- DC combiner box: **Mi-INVERTER** 50kW x 2 pc
- Supporting structure: **PosMAC**, rust-free racking system (sustainable up to 45 m/sec wind)

✓Design & Construction

✓O&M (Operation & Maintenance)

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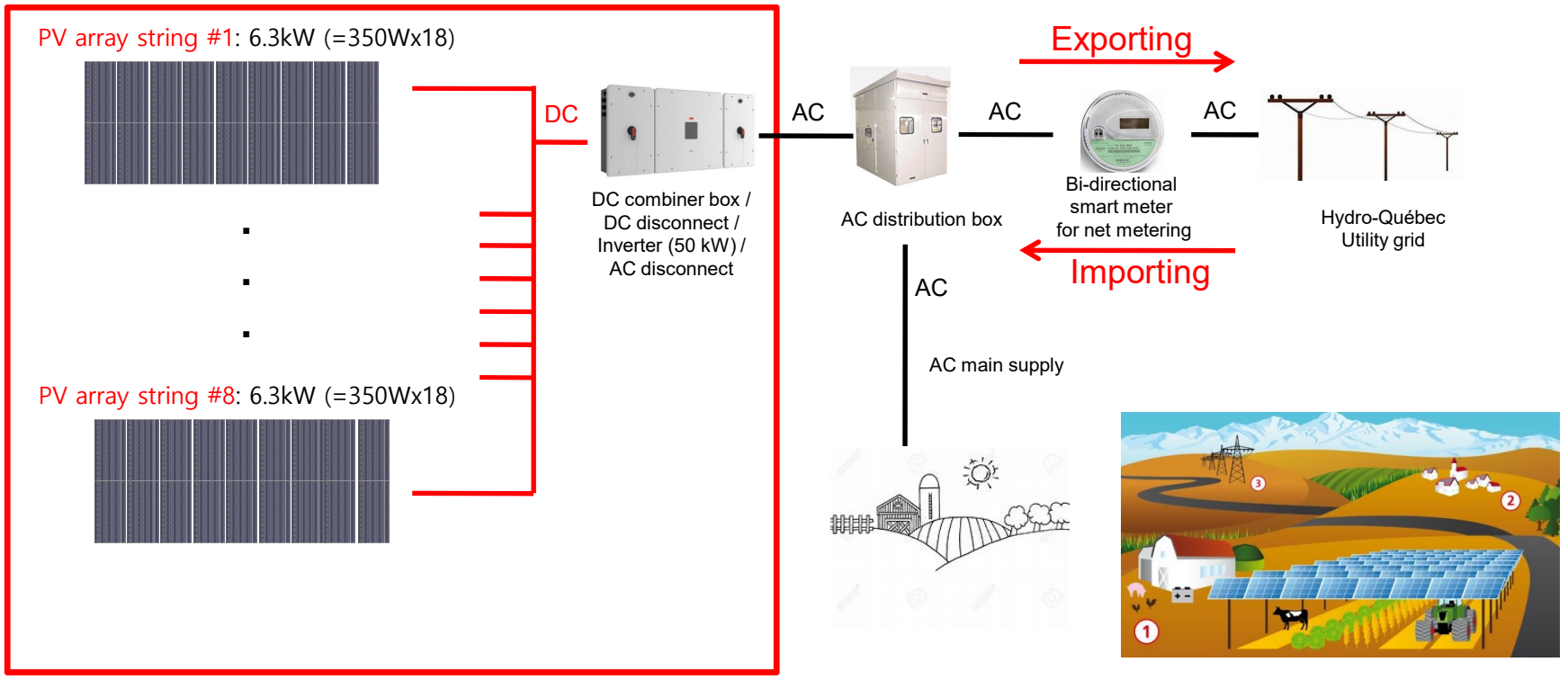
Examples of 100kW Solar PV system

Schema of 100 kW solar PV plant kit (grid-tied)



2 x 50kW solar PV system

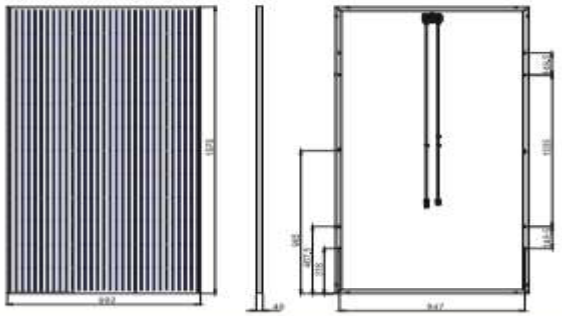
Components (1) – Solar Module (SHINSUNG)

PID-free!

Lowest LID!

Tier-1 Quality!

72Cell MONO



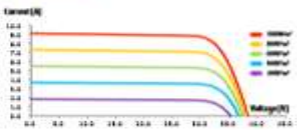
Item	SS-DM350	SS-DM355	SS-DM360
Peak Power(Wp)	350	355	360
Open Circuit Voltage(V)	46.78	46.99	47.20
Short Circuit Current(A)	9.84	9.91	9.98
Voltage at Pmax(V)	37.82	38.02	38.23
Current at Pmax(A)	9.26	9.35	9.43
Efficiency(%)	17.91	18.17	18.42
Dimension(mm)	992 X 1,970 X 40		
Weight(Kg)	21.8±0.2		

※ All data is tested under STC(Standard Test Conditions). Above data may be changed without prior notice.
※ Peak power tolerance 0 ~ +3.0%

• Temperature Coefficient (Cell)

NOCT	45±3(℃)
α Δ ISC	0.0476(%/degree)
β Δ VOC	-0.3070(%/degree)
γ Δ Pmax	-0.3753(%/degree)

• I-V Curve



• Mechanical Characteristics

Solar Cells	156.75 x 156.75mm
Front Glass	Low Iron Tempered Glass
Junction Box	JM13B: IP67 / 3Bypass Diode & Smart J/Box
Output Cable	4㎟ Cable, MC 4(Compatible) Type
Frame	AL Alloy Type(Anodized)

• Tested Operation Conditions

Max Load	40 lbs/ft2
Impact Resistance	25mm, 23m/s
Operating emperature	-40~+85℃
System Voltage	1,500V (Smart J/Box: 1000V)

• Safety Ratings & Warranties

Fire Safety Classification	Type 1
Salt-mist Corrosion Test	Tested
Visible Light Reflected	Mono (~ 5.00%), Multi(~ 5.00%) For more information, please contact us.
Warranty	10 Years limited Product Warranty 10 Years limited Power Warranty : 90% 25 Years limited Power Warranty : 80%
Certifications	UL 1703

Made in Korea Quality!

c UL us LISTED

25 years warranty!

Certified high output under -40 and 85℃

IEC 6121[illegible]

High strength test passed (550kg/m²)

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Components (2) – Inverter (ABB)

The #1 technology in market !

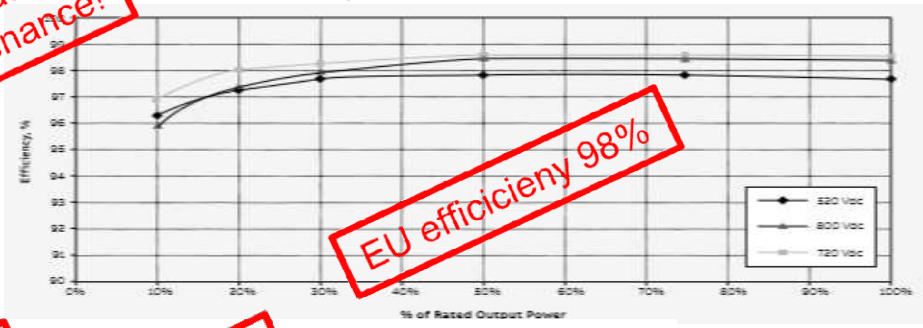
ABB string inverters

TRIO-TM-60.0-US-480

Easy installation and maintenance!

IP65 - ext. install.

✓ MPPT range: 520 – 800 Vdc



EU efficicieny 98%

Technical data and types

Type code	TRIO-50.0-TL-OUTD-US
Input side	
Absolute maximum DC input voltage ($V_{max,abs}$)	1000 V
Start-up DC input voltage (V_{start})	300...500 V (Default 360)
Operating DC input vwoltage range (V_{dcmin}...V_{dcmax})	0.7xV_{start} ...950 V (min 250 V)
Rated DC input voltage (V_{dcr})	715 Vdc
Rated DC input power (P_{dcr})	51250 W
Number of independent MPPT	1
MPPT input DC voltage range ($V_{MPPTmin}$ ... $V_{MPPTmax}$) at P_{acr}	520-800 Vdc
Maximum DC input current (I_{dcmax})	100 A
Maximum input short circuit current	144 A
Number of DC inputs string / pairs	12 or 16 string combiner version available / standard version 2
DC connection type	Input lugs (type 1), 12/16 string field wired fuse holders (type 2), 12/16 string quick connectors (type 3)
Operating performance	
Maximum efficiency (ηmax)	98.6%
Weighted efficiency (CEC)	98.0%
Safety	
Isolation level	Transformerless
Marking	TUV
Safety and EMC standard	UL1741, Rule 21, HECO tester per UL 1741 SA, UL1699B, IEEE1547, IEEE1547.1, CSA C22.2 107.1-01-2001, FCC Part 15 Sub-part B Class B Limits

Reliability!

Rapid CS availability!

Maximizing ROI!

10 years warranty!

Operational Temp. range: -25 ~ 60 C

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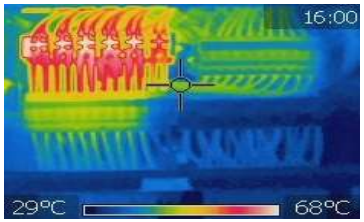
Components (3) - DC combiner box (Mi-inverter)

Fire-proof Tested !

Safe!

Made in Korea Quality!

IP54 - ext. install.



✓protective diode for preventing reverse current (1200Vdc)

✓ Heatsink design

✓ Failure check mode

✓ Fuse holder for 1100V

✓ Internal disconnect switch or circuit breaker

✓ Protection from surge (1000V, 400kA)

✓ Monitoring each string up to 20 CH

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Components (4) – Support structure (PosMAC)

✓ **PosMAC**, POSCO Magnesium (3%) Aluminium (2.5%) Zinc alloy Coating steel products

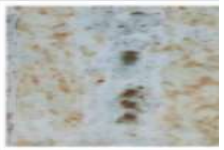
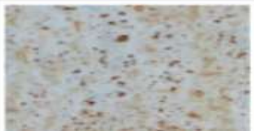
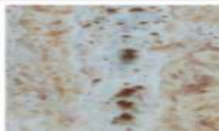
✓ **Rust-free iron** → Corrosion resistance 10 times stronger than conventional hot dip galvanized steel.

Rust-free for 25 years!

Quality/Cost!

Made in Korea quality

25 years warranty!

SST	PosMAC	BATCH Zn Coated sample		
	120g/m²	500g/m²	540g/m²	580g/m²
300 Hr				
500 Hr				

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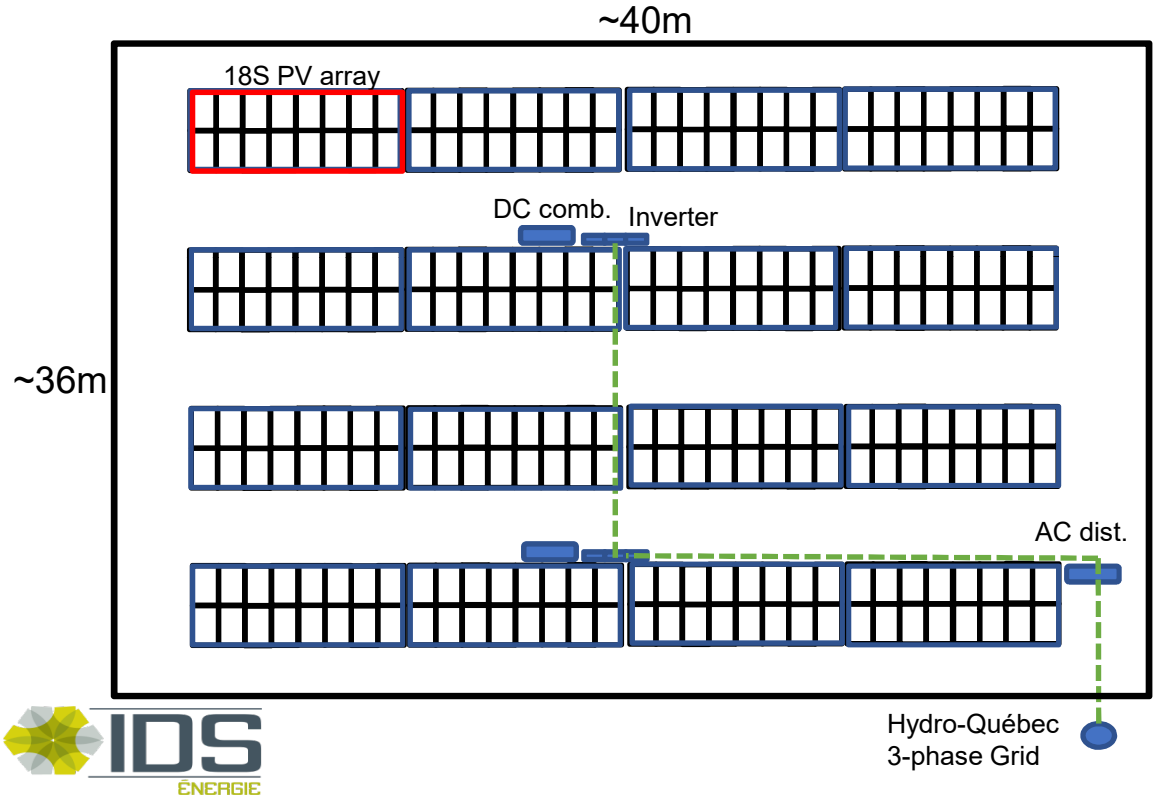
Design & Construction (1) – layout of 100kW solar plant

✓PV array : 2 groups of 18 series x 8 parallel (string) connection to the inverter, 2 x 18 x 8 = 288 modules installed
✓ Installation area (ground) required for 35° tilt angle: ~ 1500 m^2 (= 16 144 ft^2)



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Design & Construction (2) – matching between PV arrays and inverter

To maximize the electricity production, its is essential to design the best coupling possible between the inverter and the PV arrays.

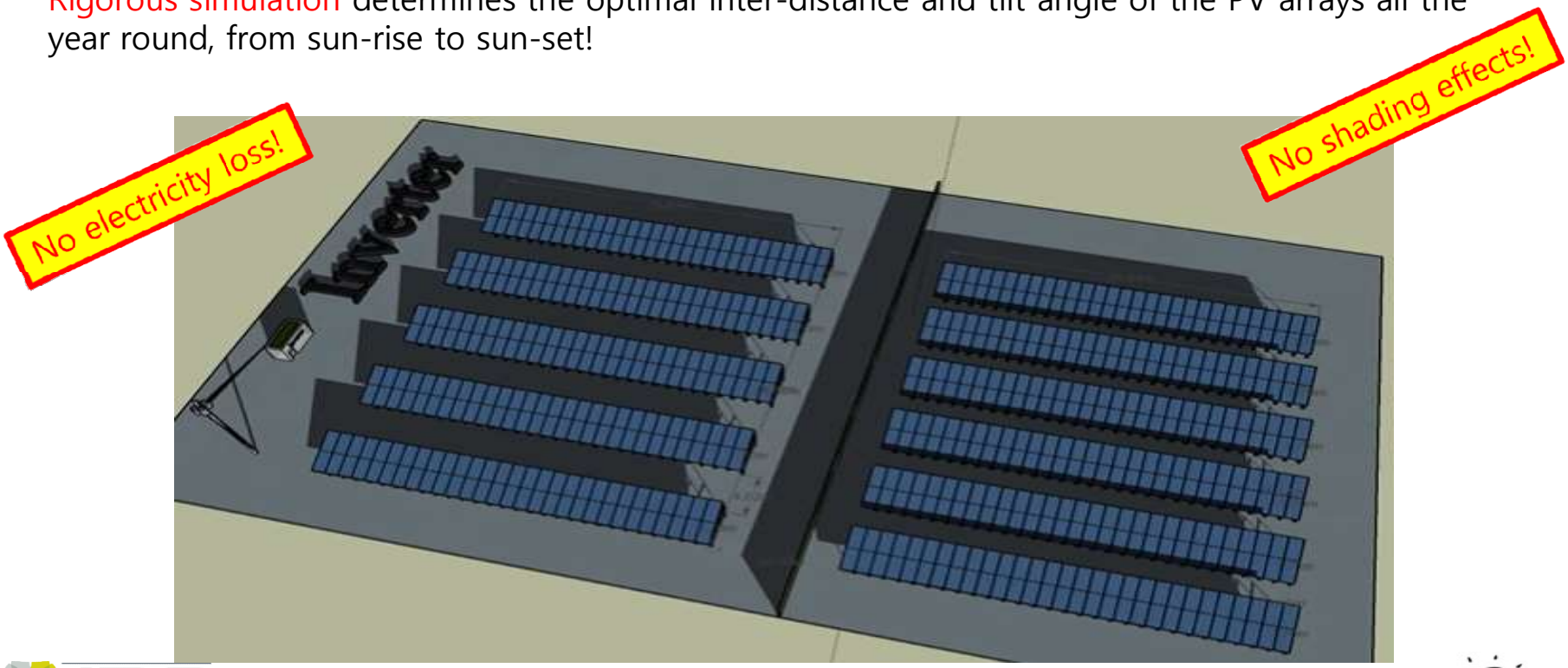
No electricity loss or operation stop in hot seasons!

Perfect match to maximize electricity production!

PV plant	Module Power output (W)			350										
	PV plant design power (kW)			50										
	PV plant actual power (kW)			50.40	50.05	53.90	52.50	50.40	53.55	50.40	53.20	56.00	51.45	53.90	56.35
	# of parallels			12	11	11	10	9	9	8	8	8	7	7	7
Module	# of Series			12	13	14	15	16	17	18	19	20	21	22	23
	46.78	25	°C	561	608	655	702	748	795	842	889	936	982	1029	1076
	Voc	70		475	515	555	594	634	674	713	753	792	832	872	911
		-25		657	712	766	821	876	930	985	1040	1095	1149	1204	1259
	37.82	25	°C	454	492	529	567	605	643	681	719	756	794	832	870
	Vmp	70		384	416	448	481	513	545	577	609	641	673	705	737
		-25		531	575	619	664	708	752	796	841	885	929	973	1018
Inverter	Input voltage	min(V)	360	100% kW	3phase, 50kW (Transformerless), ABB										
		Max(V)	1000	50											
	MPPT	min(V)	520	105% kW	Within the MPPT range of module array in Winter										
		Max(V)	800	52.5	Within the MPPT range of module rarry in Summer										

Design & Construction (3) – shading effect consideration

Rigorous simulation determines the optimal inter-distance and tilt angle of the PV arrays all the year round, from sun-rise to sun-set!



Ref.: MI-Inverter

Design & Construction (4) – Type of structure

Fixed

- Fixed at optimal angle
- South azimuth
- easy installation/maintenance
- efficiency: 100%

1-axis tilted

- Seasonal variation (3 angles)
- South azimuth
- manual angle adjustment
- efficiency: 105%

Easy maintenance

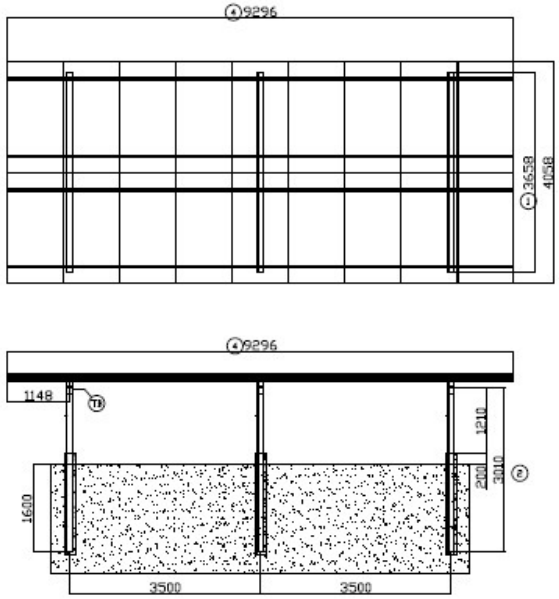
Safe!
- wind load
up to 45 m/s

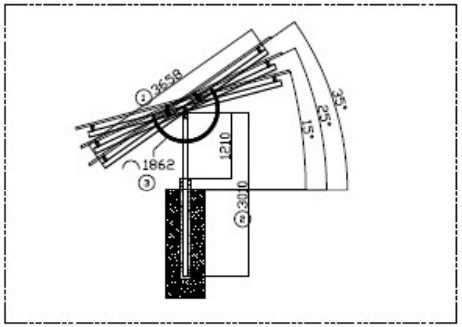
Cost-effective!

Design & Construction (5) – ground mount foundation

Grouting mount

Anchored mount





Safe!
wind load up to 45 m/sec
= 162 km/hr = 100 mph

Construction of Solar PV plant (1)

GPS coordination exam.

Receiving/loading materials (PosMAC, module, cable, etc..)

Hole marking

Drilling holes (200ϕ 2000mm)

Installing pole structure / fixing with wood supports

Construction of Solar PV plant (2)

linearisation (c-shape)


milk-concreting (concrete/water/expansion agent)



Assembling girder & upper structure



Attaching modules, bolting and finishing


O&M (operation & Maintenance)

Proper operation and maintenance is the key to produce maximum electricity for more than 25 years to come!

(1) Basic service plan
- Electrical safety check, remote monitoring, emergency dispatch service in case of problem, thermal imaging

(2) Operation and Maintenance Service plan
- Inverter and panel repair, other consumable repair and management, insurance

(3) Additional services :
- Cleaning of module and virtually all management

End of document

IDS Énergie and PVavenue Inc. proudly
presented a “100 kW solar PV plant kit in Québec, Canada”.

Thank you very much!

For more information, please contact
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