

# Solargis Evaluate Report

## Annex I. PV configuration details

Project name: Mallakastër, Fier, ALB

Energy system name: PV system

Report ID: 6CXJOT54KD

### 1 List of PV configuration items

Table 2.1	System properties	3
Table 3.1	Grid connection	3
Table 4.1	Auxiliary losses	3
Table 4.2	Degradation losses	3
Table 4.3	Environment losses	3
Table 4.4	Unavailability losses	4
Table 5.1	Array 1	4
Table 5.2	Array 2	5
Table 5.3	Array 3	5
Table 5.4	Array 4	6
Table 5.5	Array 5	6
Table 6.1	Buildable area 14	7
Table 6.2	Segment 1	7
Table 6.3	Segment 2	7
Table 6.4	Segment 3	7
Table 6.5	Segment 4	8
Table 7.1	Inverter setup (A)	8
Table 7.2	Inverter setup (B)	8
Table 7.3	Inverter setup (C)	8
Table 7.4	Inverter setup (D)	9
Table 7.5	Inverter setup (E)	9
Table 8.1	PV module: JA Solar   JAM72D42-640/LB	9
Table 9.1	Inverter: Power-One   ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]	10
Table 10.1	Inverter transformer 690 / 22,000 V	10
Table 10.2	Inverter transformer 690 / 22,000 V	10
Table 10.3	Inverter transformer 690 / 22,000 V	10

Table 10.4	Inverter transformer 690 / 22,000 V	11
Table 11.1	Cabling losses	11

## 2 System

**Table 2.1** System properties

DC installed capacity	31,979.52 kWp
DC/AC ratio range	0.86 - 1.26
PV modules count - total	49,968 pcs / 1 type(s)
Inverters count - total	36 pcs / 1 type(s)
Inverter transformers count - total	5 pcs / 4 type(s)
Area - total	232,711 m <sup>2</sup>
Number of arrays	5
CAPEX	0 \$ (some items do not have a defined unit price)

## 3 Grid connection

**Table 3.1** Grid connection

Power limit	Unlimited
Power factor (cos phi)	1
Number of AC phases	3
Voltage	22 kV
Apparent rated power	33,800 kVA

## 4 Losses

**Table 4.1** Auxiliary losses

Day constant losses	8 kW (0.025 %)
Day constant losses from inverter power threshold	0 kW (0 %)
Day proportional losses	5 W/kW
Day proportional losses from inverter power threshold	0 kW (0 %)
Night constant losses	8 kW (0.025 %)

**Table 4.2** Degradation losses

Degradation first year	2 %
Annual degradation	0.5 %

**Table 4.3** Environment losses

Soiling losses (monthly)	Default 3 %
Manual cleaning events	No manual cleaning
Snow losses (monthly)	Default 0 %

**Table 4.4** Unavailability losses

Internal (yearly)	0.5 %
External (yearly)	0 %

## 5 Arrays

**Table 5.1** Array 1

Name	Array 1
Mounting type	Fixed one angle
DC installed capacity	7,833.6 kWp
Connected to inverter setup	Inverter setup (A)
Area	54,252 m²
Row spacing (relative • GCR • absolute)	1.4 • 71 % • 3.45 m
Azimuth (specific / effective)	180° / 181.09°
Tilt (specific / effective)	33.21° / 33.9°
Module manufacturer	JA Solar
Module model	JAM72D42-640/LB
Confidence class	A
Module orientation	Portrait
Number of modules	12,240 pcs
String size [modules]	18 pcs
Full table size	3 string(s) / 54 modules
Full table dimensions	62.296 x 2.465 m
Number of full tables	225 pcs
Number of half tables	0 pcs
Number of third tables	5 pcs
Number of quarter tables	0 pcs
Clearance height	1 m
Distance between tables	2 m
Columns of PV modules on full table	54 pcs
Rows of PV modules on table	1 pcs
Horizontal gap between PV modules	2 cm
Vertical gap between PV modules	2 cm

**Table 5.2**     Array 2

Name	Array 2
Mounting type	Fixed one angle
DC installed capacity	5,345.28 kWp
Connected to inverter setup	Inverter setup (B)
Area	40,166 m <sup>2</sup>
Row spacing (relative • GCR • absolute)	1.5 • 67 % • 3.7 m
Azimuth (specific / effective)	180° / 181.37°
Tilt (specific / effective)	33.21° / 33.63°
Module manufacturer	JA Solar
Module model	JAM72D42-640/LB
Confidence class	A
Module orientation	Portrait
Number of modules	8,352 pcs
String size [modules]	18 pcs
Full table size	3 string(s) / 54 modules
Full table dimensions	62.296 x 2.465 m
Number of full tables	146 pcs
Number of half tables	0 pcs
Number of third tables	26 pcs
Number of quarter tables	0 pcs
Clearance height	1 m
Distance between tables	2 m
Columns of PV modules on full table	54 pcs
Rows of PV modules on table	1 pcs
Horizontal gap between PV modules	2 cm
Vertical gap between PV modules	2 cm

**Table 5.3**     Array 3

Name	Array 3
Mounting type	Fixed one angle
DC installed capacity	10,828.8 kWp
Connected to inverter setup	Inverter setup (C)
Area	79,987 m <sup>2</sup>
Row spacing (relative • GCR • absolute)	1.5 • 67 % • 3.7 m
Azimuth (specific / effective)	180° / 179.64°
Tilt (specific / effective)	33.21° / 36.2°
Module manufacturer	JA Solar
Module model	JAM72D42-640/LB
Confidence class	A
Module orientation	Portrait
Number of modules	16,920 pcs
String size [modules]	18 pcs
Full table size	3 string(s) / 54 modules
Full table dimensions	62.296 x 2.465 m
Number of full tables	306 pcs
Number of half tables	0 pcs
Number of third tables	22 pcs
Number of quarter tables	0 pcs
Clearance height	1 m
Distance between tables	2 m
Columns of PV modules on full table	54 pcs
Rows of PV modules on table	1 pcs
Horizontal gap between PV modules	2 cm
Vertical gap between PV modules	2 cm

**Table 5.4**     Array 4

Name	Array 4
Mounting type	Fixed one angle
DC installed capacity	4,481.28 kWp
Connected to inverter setup	Inverter setup (D)
Area	32,405 m <sup>2</sup>
Row spacing (relative • GCR • absolute)	1.5 • 67 % • 3.7 m
Azimuth (specific / effective)	180° / 181.73°
Tilt (specific / effective)	33.21° / 34.83°
Module manufacturer	JA Solar
Module model	JAM72D42-640/LB
Confidence class	A
Module orientation	Portrait
Number of modules	7,002 pcs
String size [modules]	18 pcs
Full table size	3 string(s) / 54 modules
Full table dimensions	62.296 x 2.465 m
Number of full tables	120 pcs
Number of half tables	0 pcs
Number of third tables	29 pcs
Number of quarter tables	0 pcs
Clearance height	1 m
Distance between tables	0.5 m
Columns of PV modules on full table	54 pcs
Rows of PV modules on table	1 pcs
Horizontal gap between PV modules	2 cm
Vertical gap between PV modules	2 cm

**Table 5.5**     Array 5

Name	Array 5
Mounting type	Fixed one angle
DC installed capacity	3,490.56 kWp
Connected to inverter setup	Inverter setup (E)
Area	25,901 m <sup>2</sup>
Row spacing (relative • GCR • absolute)	1.5 • 67 % • 3.7 m
Azimuth (specific / effective)	180° / 180.78°
Tilt (specific / effective)	33.21° / 34.06°
Module manufacturer	JA Solar
Module model	JAM72D42-640/LB
Confidence class	A
Module orientation	Portrait
Number of modules	5,454 pcs
String size [modules]	18 pcs
Full table size	3 string(s) / 54 modules
Full table dimensions	62.296 x 2.465 m
Number of full tables	101 pcs
Number of half tables	0 pcs
Number of third tables	0 pcs
Number of quarter tables	0 pcs
Clearance height	1 m
Distance between tables	0.5 m
Columns of PV modules on full table	54 pcs
Rows of PV modules on table	1 pcs
Horizontal gap between PV modules	2 cm
Vertical gap between PV modules	2 cm

## 6 Segments

**Table 6.1** Buildable area 14

Name	Buildable area 14
Segment type	Ground
Array name	Array 5
Orthogonal area	25,901 m <sup>2</sup>
Price per m <sup>2</sup>	0 \$
Orthogonal perimeter	660 m
Price per m	0 \$
Albedo	From terrain albedo
Horizon	Segment specific

**Table 6.2** Segment 1

Name	Segment 1
Segment type	Ground
Array name	Array 1
Orthogonal area	54,252 m <sup>2</sup>
Price per m <sup>2</sup>	0 \$
Orthogonal perimeter	1,163 m
Price per m	0 \$
Albedo	From terrain albedo
Horizon	Segment specific

**Table 6.3** Segment 2

Name	Segment 2
Segment type	Ground
Array name	Array 2
Orthogonal area	40,166 m <sup>2</sup>
Price per m <sup>2</sup>	0 \$
Orthogonal perimeter	1,293 m
Price per m	0 \$
Albedo	From terrain albedo
Horizon	Segment specific

**Table 6.4** Segment 3

Name	Segment 3
Segment type	Ground
Array name	Array 3
Orthogonal area	79,987 m <sup>2</sup>
Price per m <sup>2</sup>	0 \$
Orthogonal perimeter	1,892 m
Price per m	0 \$
Albedo	From terrain albedo
Horizon	Segment specific

**Table 6.5** Segment 4

Name	Segment 4
Segment type	Ground
Array name	Array 4
Orthogonal area	32,405 m <sup>2</sup>
Price per m <sup>2</sup>	0 \$
Orthogonal perimeter	810 m
Price per m	0 \$
Albedo	From terrain albedo
Horizon	Segment specific

## 7 Inverter setups

**Table 7.1** Inverter setup (A)

Name	Inverter setup (A)
Inverter manufacturer	Power-One
Inverter model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Number of inverter units	9 pcs
DC/AC ratio range	0.86 - 1.2
Total number of strings	680 pcs
Connected power	7,833.6 kWp
Connected to inverter transformer	Inverter transformer 690 / 22,000 V

**Table 7.2** Inverter setup (B)

Name	Inverter setup (B)
Inverter manufacturer	Power-One
Inverter model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Number of inverter units	6 pcs
DC/AC ratio range	1.14 - 1.2
Total number of strings	464 pcs
Connected power	5,345.28 kWp
Connected to inverter transformer	Inverter transformer 690 / 22,000 V

**Table 7.3** Inverter setup (C)

Name	Inverter setup (C)
Inverter manufacturer	Power-One
Inverter model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Number of inverter units	12 pcs
DC/AC ratio range	1.2 - 1.26
Total number of strings	940 pcs
Connected power	10,828.8 kWp
Connected to inverter transformer	Inverter transformer 690 / 22,000 V



**Table 7.4** Inverter setup (D)

Name	Inverter setup (D)
Inverter manufacturer	Power-One
Inverter model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Number of inverter units	5 pcs
DC/AC ratio range	1.18 - 1.2
Total number of strings	389 pcs
Connected power	4,481.28 kWp
Connected to inverter transformer	Inverter transformer 690 / 22,000 V

**Table 7.5** Inverter setup (E)

Name	Inverter setup (E)
Inverter manufacturer	Power-One
Inverter model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Number of inverter units	4 pcs
DC/AC ratio range	1.06 - 1.2
Total number of strings	303 pcs
Connected power	3,490.56 kWp
Connected to inverter transformer	Inverter transformer 690 / 22,000 V

## 8 PV modules

**Table 8.1** PV module: JA Solar | JAM72D42-640/LB

Manufacturer	JA Solar
Model	JAM72D42-640/LB
Confidence class	A
Count	49,968 pcs
Unit price	0 \$
Cut cell options	Half-cut
Nameplate maximum power	640 W
Technology	Mono CSI
Bifaciality factor	78% (bifacial)
Degradation yearly	0.4 %
Dimensions (L x W x T)	2.465 x 1.134 x 0.03 m
Nominal operating cell temperature	45 °C
Short circuit current	15.31 A
Open circuit voltage	52.87 V
Series resistance	0.184 Ω
Shunt resistance	260 Ω
Number of bypass diodes	3 pcs
Catalog of components ID	9aab319a-d083-4900-997d-d3a5b3f58062

## 9 Inverter units

**Table 9.1** Inverter: Power-One | ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]

Manufacturer	Power-One
Model	ULTRA-750-TL-OUTD-4-US-690-x-y-z [690V]
Confidence class	C
Count	36 pcs
Unit price	0 \$
Maximum AC power	750 kW
Min MPPT voltage	585 V
Max MPPT voltage	850 V
Maximum DC input voltage	900 V
Maximum input current per MPPT	700 A
Number of MPP trackers	2
Number of DC inputs per MPPT	10
Number of AC phases	3
Nominal AC voltage	690 V
Self consumption	3,394.9 W
Dimensions (W x H x D)	3 x 2.91 x 1.47 m
Catalog of components ID	0d0a2886-6b07-4a26-904d-3dd70124544a

## 10 Transformers

**Table 10.1** Inverter transformer 690 / 22,000 V

Name	Inverter transformer 690 / 22,000 V
Count	2 pcs
Unit price	0 \$
Losses model	Variable
Apparent rated power	10,000 kVA
No load losses	15 kW
Load losses	120 kW
Constant	-

**Table 10.2** Inverter transformer 690 / 22,000 V

Name	Inverter transformer 690 / 22,000 V
Count	1 pcs
Unit price	0 \$
Losses model	Variable
Apparent rated power	6,300 kVA
No load losses	9.5 kW
Load losses	75.6 kW
Constant	-

**Table 10.3** Inverter transformer 690 / 22,000 V

Name	Inverter transformer 690 / 22,000 V
Count	1 pcs
Unit price	0 \$
Losses model	Variable
Apparent rated power	4,000 kVA
No load losses	6 kW
Load losses	48 kW
Constant	-

**Table 10.4** Inverter transformer 690 / 22,000 V

Name	Inverter transformer 690 / 22,000 V
Count	1 pcs
Unit price	0 \$
Losses model	Variable
Apparent rated power	3,500 kVA
No load losses	5.3 kW
Load losses	42 kW
Constant	-

## 11 Cabling

**Table 11.1** Cabling losses

DC cable losses	2 %
AC cable losses (LV)	1 %
AC cable losses (MV)	0.5 %
AC cable losses (HV)	-

