/ **Project documentation**

Leevaku HEJ, päikesepark

Conceptual Engineering
Project documentation Annex
Thuleprojekt OÜ
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SMA system partner: 108972
TesVolt system partner: 033988

Project number: 23271
Location: Estonia / Leevaku
Date: 8/1/2023

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TesVolt system partner: 033988

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Estonia

Project: Leevaku HEJ, päikesepark
Project number: 23271

Location: Estonia / Leevaku
Grid voltage: 230V (230V / 400V)

System overview

56 x Longi Solar LR5-54HPH-410M (08/2022) (PV array 1)
Azimuth angle: -33 °, Tilt angle: 35 °, Mounting type: Roof, Peak power: 22.96 kWp

1 x SMA STP 20-50

PV design data

Total number of PV modules:	**56**	Energy usability factor:	**99.8 %**
Peak power:	**22.96 kWp**	Performance ratio*:	**88.1 %**
Number of PV inverters:	**1**	Spec. energy yield*:	**954 kWh/kWp**
Nominal AC power of the PV inverters:	**20.00 kW**	Line losses (in % of PV energy):	**0.23 %**
AC active power:	**20.00 kW**	Unbalanced load:	**0.00 VA**
Active power ratio:	**87.1 %**	CO_2 reduction after 20 years:	**373 t**
Annual energy yield*:	**21,898 kWh**		

Notes:

Roof-top

*Important: The yield values displayed are estimates. They are determined mathematically. SMA Solar Technology AG accepts no responsibility for the real yield value which can deviate from the yield values displayed here. Reasons for deviations are various external conditions, such as soiling of the PV modules or fluctuations in the efficiency of the PV modules.

Your energy system at a glance

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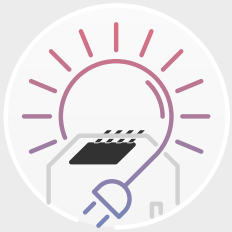
/ Energy system

PV system	**PV inverter** 1 x SMA STP 20-50	**PV arrays** 56 x Longi Solar LR5-54HPH-410M
Additional components	**Energy management** 1 x SUNNY PORTAL powered by ennexOS	
System size	**PV system** 22.96 kWp	

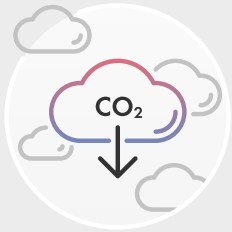
Benefits

0.131 EUR
Electricity production cost over 20 year(s)



8.0 a
Expected amortization period

10.50 %
Annual return (IRR)



373 t
CO_2 reduction after 20 years

Feed-in tariff after 20 year(s): 62,666 EUR

Inverter designs

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Ambient temperature:
Annual extreme low temperature: -40 °C
Average high Temperature: 9 °C
Annual extreme high temperature: 33 °C

/ Subproject Subproject 1

1 x SMA STP 20-50 (PV system section 1)

Peak power:	22.96 kWp
Total number of PV modules:	56
Number of PV inverters:	1
Max. DC power (cos φ = 1):	20.41 kW
Max. AC active power (cos φ = 1):	20.00 kW
Grid voltage:	230V (230V / 400V)
Nominal power ratio:	89 %
Dimensioning factor:	114.8 %
Displacement power factor cos φ:	1
Full load hours:	1094.9 h

PV design data

Input A: PV array 1
21 x Longi Solar LR5-54HPH-410M (08/2022), Azimuth angle: -33 °, Tilt angle: 35 °, Mounting type: Roof

Input B: PV array 1
21 x Longi Solar LR5-54HPH-410M (08/2022), Azimuth angle: -33 °, Tilt angle: 35 °, Mounting type: Roof

Input C: PV array 1
14 x Longi Solar LR5-54HPH-410M (08/2022), Azimuth angle: -33 °, Tilt angle: 35 °, Mounting type: Roof

	Input A:	Input B:	Input C:
Number of strings:	1	1	1
PV modules:	21	21	14
Peak power (input):	8.61 kWp	8.61 kWp	5.74 kWp
Inverter min. DC voltage (Grid voltage 230 V):	150 V	150 V	150 V
PV typical voltage:	✓ 640 V	✓ 640 V	✓ 426 V
Min. PV voltage:	577 V	577 V	385 V
Max. DC voltage (Inverter):	1000 V	1000 V	1000 V
Max. PV voltage	✓ 917 V	✓ 917 V	✓ 612 V
Inverter max. operating input current per MPPT:	24 A	24 A	24 A
Max. MPP current of PV array:	✓ 13.1 A	✓ 13.1 A	✓ 13.1 A
Inverter max. input short-circuit current per MPPT:	37.5 A	37.5 A	37.5 A
PV max. circuit current	✓ 13.9 A	✓ 13.9 A	✓ 13.9 A

PV/Inverter compatible
You get this inverter including SMA ShadeFix. SMA ShadeFix is a patented inverter software that automatically optimizes the yield of PV systems in any situation. Even under shading conditions.

Cable sizing

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Overview

	DC	LV	Total
Power loss at nominal operation	87.18 W	189.67 W	276.84 W
Rel. power loss at rated nominal operation	0.37 %	0.95 %	1.32 %
Total cable length	150.00 m	70.00 m	220.00 m
Cable cross-sections	6 mm²	16 mm²	6 mm² 16 mm²

Graphic

DC cables

		Cable material	Single length	Cross section	Voltage drop	Rel. power loss
Subproject 1						
1 x SMA STP 20-50 PV system section 1	A	Copper	20.00 m	6 mm²	1.6 V	0.26 %
	B	Copper	25.00 m	6 mm²	2 V	0.33 %
	C	Copper	30.00 m	6 mm²	2.4 V	0.59 %

Cables LV1

	Cable material	Single length	Cross section	Cable resistance	Rel. power loss
Subproject 1					
1 x SMA STP 20-50 PV system section 1	Copper	70.00 m	16 mm²	R: 25.083 mΩ XL: 5.250 mΩ	0.95 %

Design energy management

Project: Leevaku HEJ, päikesepark
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PV system	System Monitoring
Subproject 1	**External**
1 x SMA STP 20-50 PV system section 1	SUNNY PORTAL powered by ennexOS Sunny Portal powered by ennexOS is the new online portal for professionally monitoring and managing PV systems on the basis of our ennexOS platform

Information

General

The maximum communication range for Bluetooth® Wireless Technology in free-field conditions and for Speedwire (SMA Ethernet) is 100 m.

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Subproject 1

1 x SMA STP 20-50 (PV system section 1)

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Monthly values

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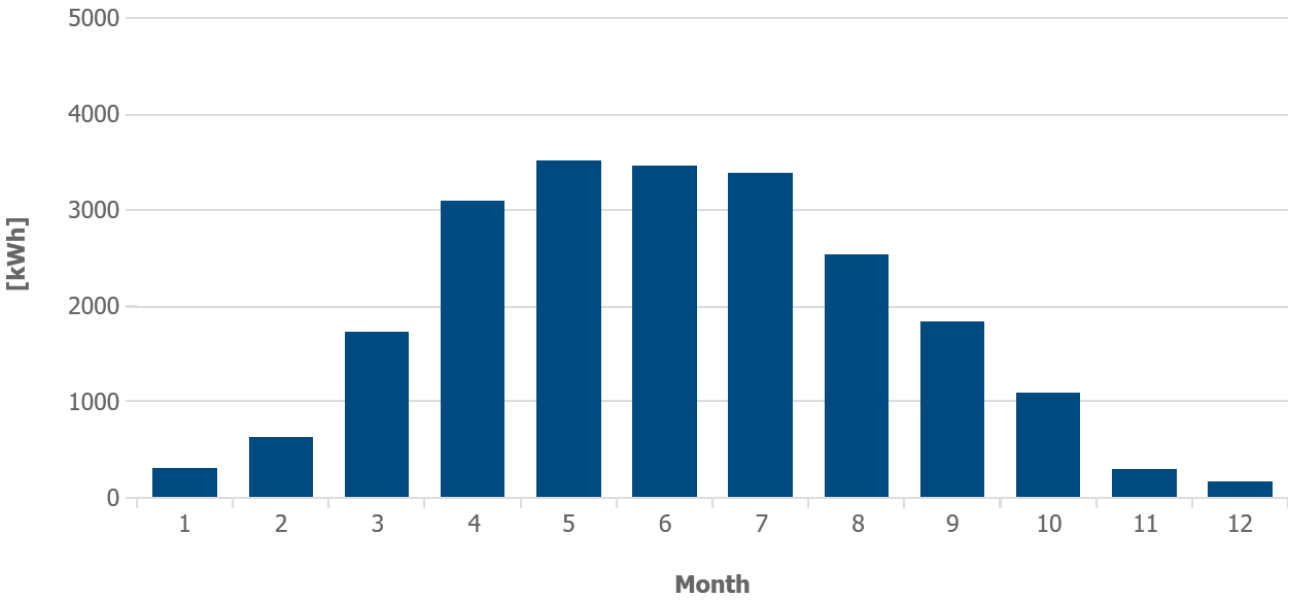
Energy yield



Month	Energy yield [kWh]	Performance ratio
1	299 (1.4 %)	83 %
2	624 (2.8 %)	89 %
3	1716 (7.8 %)	91 %
4	3078 (14.1 %)	90 %
5	3500 (16.0 %)	89 %
6	3444 (15.7 %)	88 %
7	3368 (15.4 %)	87 %
8	2520 (11.5 %)	87 %
9	1821 (8.3 %)	88 %
10	1078 (4.9 %)	88 %
11	291 (1.3 %)	82 %
12	160 (0.7 %)	80 %