

PVsyst - Simulation report

Grid-Connected System

Project: District women hospital barabanki

Variant: New simulation variant

Unlimited sheds

System power: 204 kWp

Jalālpur - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
27/11/24 16:55
with V8.0.2

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Project summary

Geographical Site

Jalālpur

India

Situation

Latitude 26.93 °N

Longitude 81.19 °E

Altitude 111 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Jalālpur

Meteonorm 8.2 (1996-2015), Sat=100% - Synthetic

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth -15 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

352 units

Pnom total

204 kWp

Inverters

Nb. of units

3 units

Pnom total

170 kWac

Pnom ratio

1.201

Results summary

Produced Energy	281573 kWh/year	Specific production	1379 kWh/kWp/year	Perf. Ratio PR	86.86 %
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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °
Azimuth -15 °

Unlimited sheds

Sheds configuration

Nb. of sheds 5 units
Unlimited sheds
Shading limit angle
Limit profile angle 8.2 °

Sizes

Sheds spacing 6.60 m
Collector width 3.00 m
Average GCR 45.5 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Free Horizon

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 66 units
Nominal (STC) 38.3 kWp
Modules 6 string x 11 In series

At operating cond. (50°C)

Pmpp 35.5 kWp
U mpp 452 V
I mpp 79 A

Inverter

Manufacturer Growatt New Energy
Model MID 30KTL3-X
(Original PVsyst database)

Unit Nom. Power 30.0 kWac
Number of inverters 1 unit
Total power 30.0 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.28
Power sharing within this inverter

Array #2 - Sub-array #2

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 77 units
Nominal (STC) 44.7 kWp
Modules 7 string x 11 In series

At operating cond. (50°C)

Pmpp 41.4 kWp
U mpp 452 V
I mpp 92 A

Inverter

Manufacturer Growatt New Energy
Model MID 40KTL3-X
(Original PVsyst database)

Unit Nom. Power 40.0 kWac
Number of inverters 1 unit
Total power 40.0 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.12
Power sharing within this inverter



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PV Array Characteristics

Array #3 - Sub-array #3

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 209 units
Nominal (STC) 121 kWp
Modules 11 string x 19 In series

At operating cond. (50°C)

Pmpp 112 kWp
U mpp 780 V
I mpp 144 A

Total PV power

Nominal (STC) 204 kWp
Total 352 modules
Module area 909 m²

Inverter

Manufacturer Growatt New Energy
Model MAX 100KTL3-X LV
(Original PVsyst database)

Unit Nom. Power 100 kWac
Number of inverters 1 unit
Total power 100 kWac
Operating voltage 180-1000 V
Pnom ratio (DC:AC) 1.21
Power sharing within this inverter

Total inverter power

Total power 170 kWac
Number of inverters 3 units
Pnom ratio 1.20

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

Serie Diode Loss

Voltage drop 0.7 V
Loss Fraction 0.1 % at STC

LID - Light Induced Degradation

Loss Fraction 0.3 %

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Array #1 - PV Array

Loss Fraction 0.5 % at MPP

Array #2 - Sub-array #2

Loss Fraction 0.5 % at MPP

Array #3 - Sub-array #3

Loss Fraction 0.5 % at MPP

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.992	0.963	0.917	0.812	0.567	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 94 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 80 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 88 mΩ
Loss Fraction 1.5 % at STC



System losses

Unavailability of the system

Time fraction 1.0 %
3.7 days,
3 periods

AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri
Loss Fraction 0.08 % at STC

Inverter: MID 30KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 50 mm²
Wires length 30 m

Inverter: MAX 100KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 95 mm²
Wires length 0 m

Inverter: MID 40KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 25 mm²
Wires length 0 m



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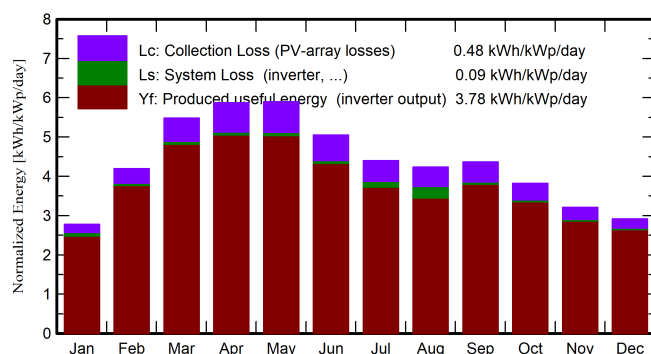
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Main results

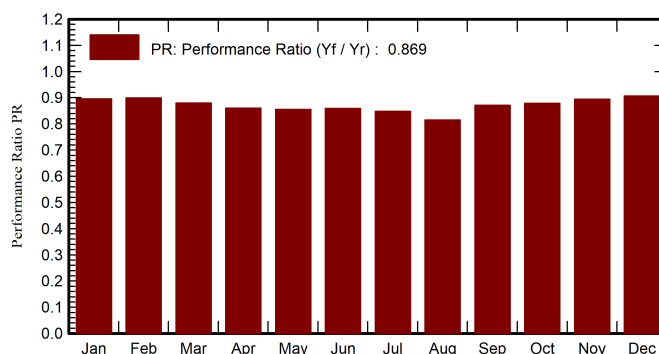
System Production

Produced Energy (P50)	281573 kWh/year	Specific production (P50)	1379 kWh/kWp/year	Perf. Ratio PR	86.86 %
Produced Energy (P90)	275064 kWh/year	Specific production (P90)	1347 kWh/kWp/year		
Produced Energy (P75)	278151 kWh/year	Specific production (P75)	1362 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

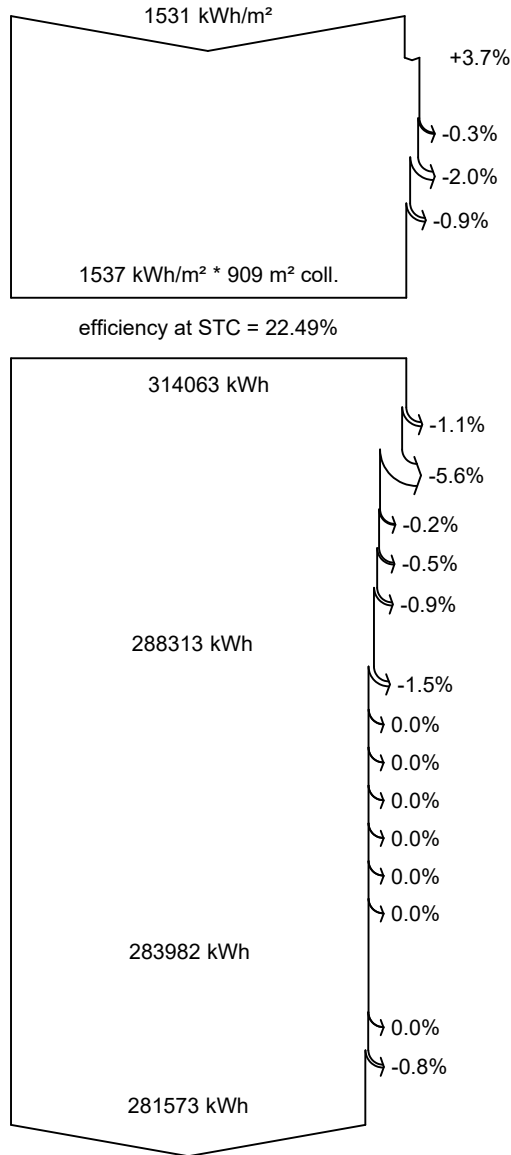
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	78.5	51.4	14.06	86.1	83.1	16285	15734	0.895
February	107.7	59.8	18.43	117.4	113.8	21898	21573	0.900
March	160.3	78.0	24.12	170.0	164.8	30988	30536	0.880
April	172.0	87.4	29.84	176.2	170.9	31423	30968	0.861
May	183.4	101.1	32.64	182.9	177.4	32415	31931	0.855
June	153.6	96.3	32.14	151.4	146.6	26974	26553	0.859
July	137.2	87.4	29.97	136.5	132.1	24521	23613	0.848
August	130.6	88.2	29.44	131.3	126.9	23696	21849	0.815
September	126.6	75.8	28.47	131.0	126.6	23647	23290	0.871
October	112.2	74.5	26.25	118.4	114.5	21550	21221	0.878
November	88.1	58.6	20.54	96.2	92.9	17827	17561	0.894
December	80.9	51.2	15.71	90.4	87.3	17003	16745	0.907
Year	1531.2	909.5	25.16	1587.9	1537.0	288227	281573	0.869

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

Soiling loss factor

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

AC ohmic loss

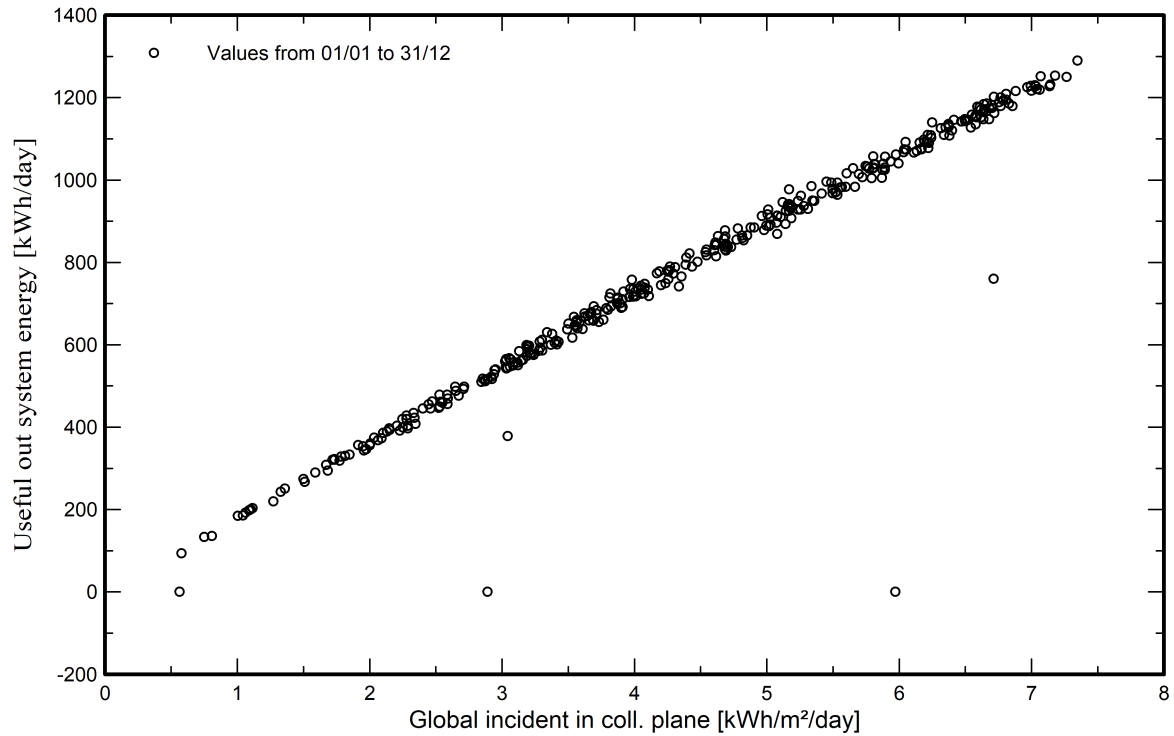
System unavailability

Energy injected into grid

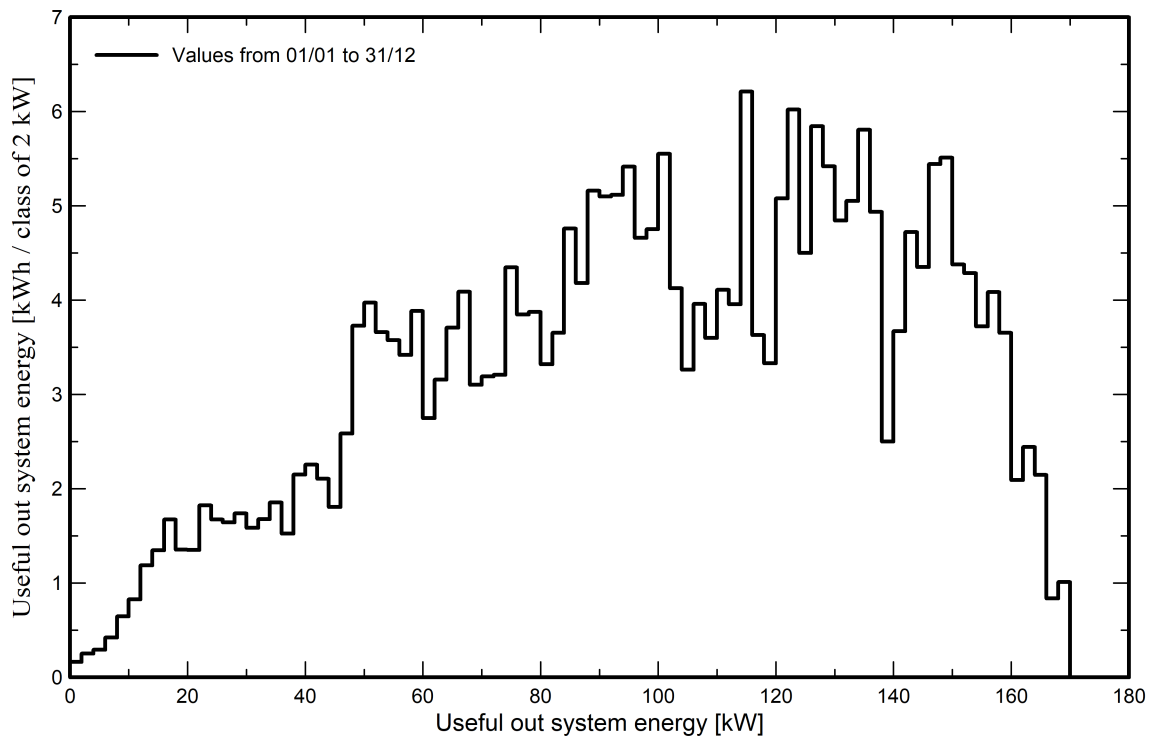


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





P50 - P90 evaluation

Weather data

Source Meteonorm 8.2 (1996-2015), Sat=100%
Kind Not defined
Year-to-year variability(Variance) 0.0 %

Specified Deviation

Global variability (weather data + system)

Variability (Quadratic sum) 1.8 %

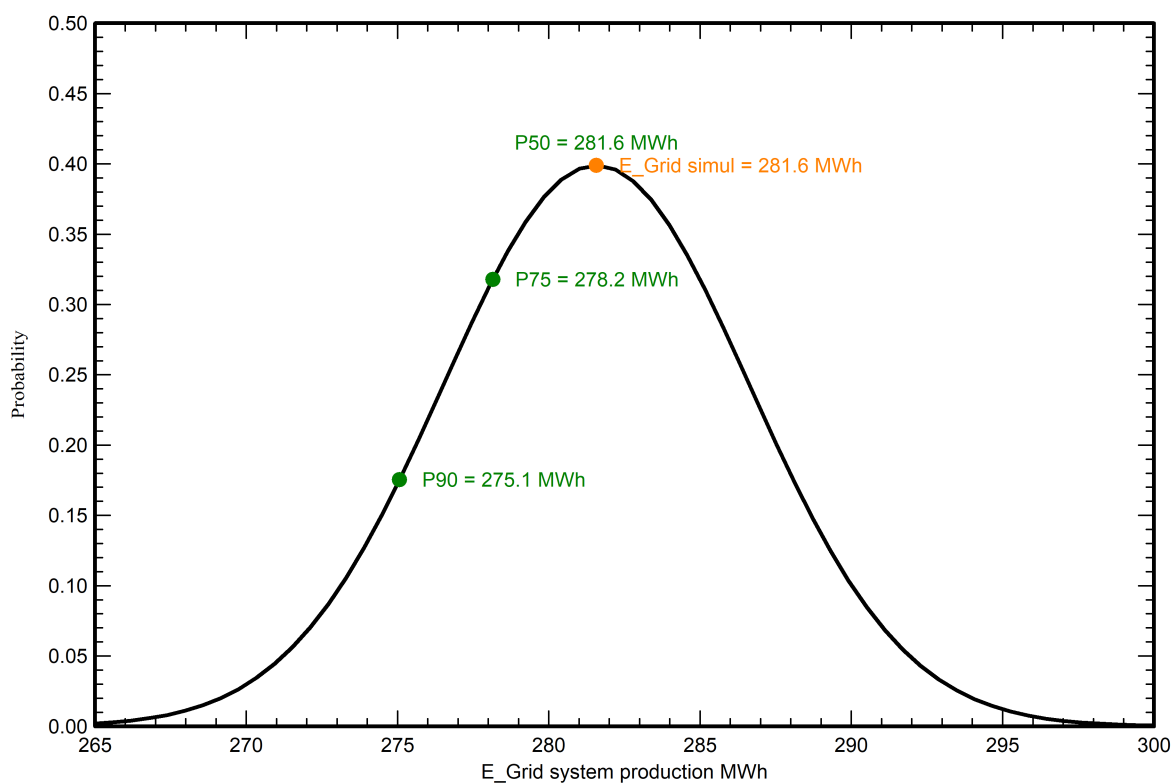
Simulation and parameters uncertainties

PV module modelling/parameters 1.0 %
Inverter efficiency uncertainty 0.5 %
Soiling and mismatch uncertainties 1.0 %
Degradation uncertainty 1.0 %

Annual production probability

Variability 5.1 MWh
P50 281.6 MWh
P90 275.1 MWh
P75 278.2 MWh

Probability distribution

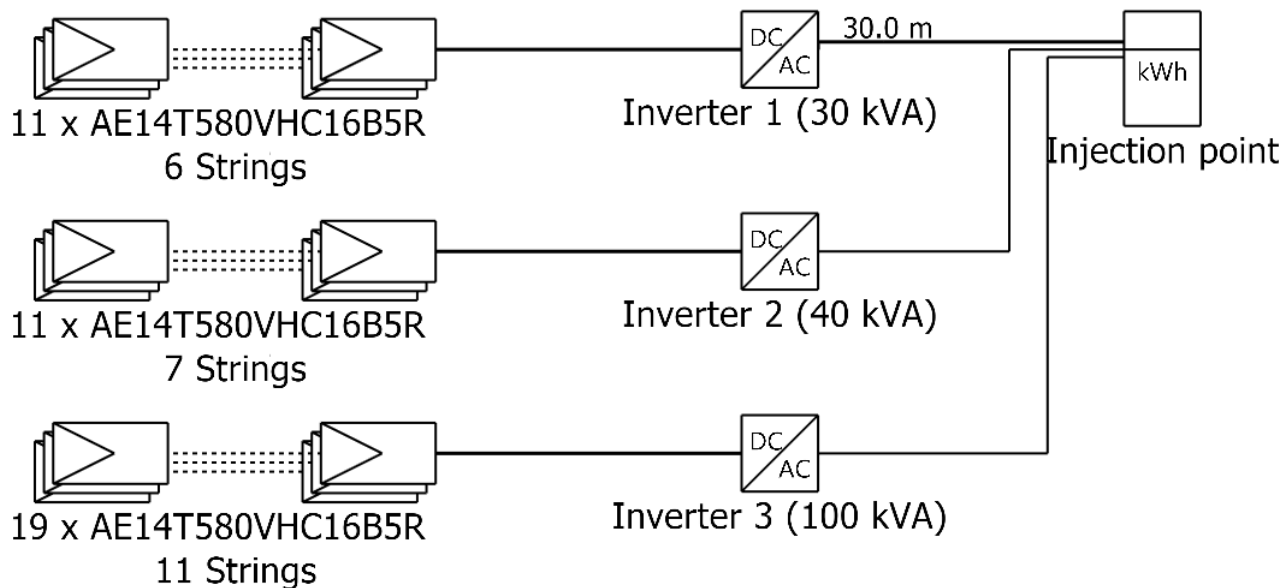




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MID 30KTL3-X
Inverter 2	MID 40KTL3-X
Inverter 3	MAX 100KTL3-X LV
String 1	11 x AE14T580VHC16B5R
String 2	19 x AE14T580VHC16B5R

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