HeliCAL

Pre - Feasibility Report of your Solar Power Plant

Date: **16 February, 2016**

Report No: **01160216105**

Report Type: **Basic**

Customer Name : **John Doe**

Customer Type : **Rooftop PV-Residential**

Site Name : **John Villa**

Site Address / City : **Hill view road, Austin Texas, 78701**

Lat-Long Co-ordinates : **31.968599, -99.901813**

Email : **johndoe89801@gmail.com**

Contact No : **922222222222**

Meteorological Data Source : **GeoModel Solar**

System Capacity : **2.00kWp**

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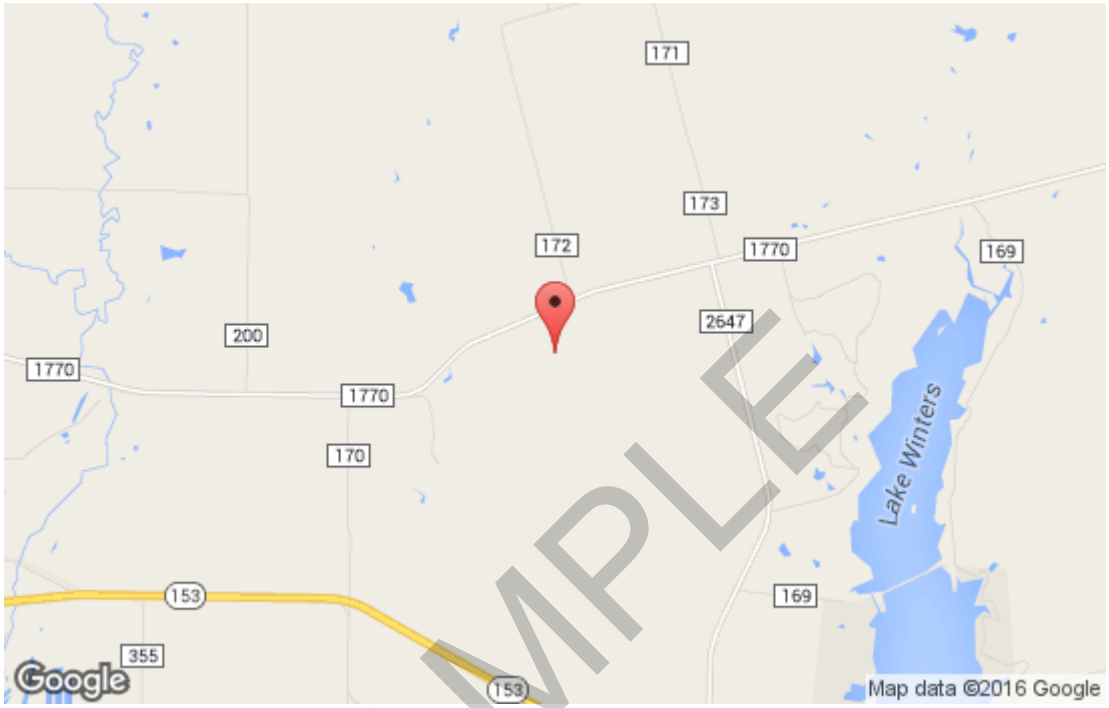
Geographic position



Solar Photovoltaic (PV) System Sizing

System	
System Type	Grid-connected
Installed Power (KW)	2.00

PV Module	
Module Type	crystalline silicon (c-Si)
Module Make	Aditi Solar
Module Capacity (Wp)	250
Total no. of modules	8

Mounting System	
Mounting Type	Roof Mounted
Tilt Direction (deg)	180 S
Tilt Degree (deg)	30

Global Horizontal Irradiation and Air Temperature

Month	Ghm	Ghd	Dhd	T24
January	32.2	1.04	0.59	-2.5
February	49.9	1.78	0.96	-1.1
March	94.6	3.05	1.58	3.0
April	123.8	4.13	2.10	8.5
May	157.1	5.07	2.57	13.5
June	166.0	5.53	2.76	17.1
July	163.2	5.27	2.64	19.8
August	149.2	4.81	2.29	19.5
September	99.4	3.31	1.67	13.7
October	65.1	2.10	1.12	8.6
November	33.2	1.11	0.68	3.1
December	23.9	0.77	0.47	-1.8
Year	**1157.6**	**3.17**	**1.62**	**8.5**

- Ghm - Monthly sum of global irradiation (kWh/m2)
- Ghd - Daily sum of global irradiation (kWh/m2)
- Dhd - Daily sum of diffuse irradiation (kWh/m2)
- T24 - Daily Diurnal air temperature

Global Horizontal Irradiation (GHI) is the radiation received by a horizontal plane to the surface of the earth. The GHI is mainly used to calculate the PV Electricity yield.

Global In-Plane Irradiation

Month	Gim	Gid	Did	Rid	Shloss
January	56.1	1.81	0.71	0.01	0.5
February	75.2	2.69	1.10	0.02	0.5
March	122.0	3.94	1.73	0.03	0.5
April	140.8	4.69	2.19	0.03	0.4
May	163.4	5.27	2.59	0.04	0.4
June	166.8	5.56	2.75	0.05	0.4
July	167.0	5.38	2.65	0.04	0.4
August	164.8	5.32	2.39	0.04	0.4
September	121.8	4.07	1.80	0.03	0.5
October	92.0	2.97	1.26	0.02	0.5
November	52.3	1.74	0.77	0.01	0.6
December	42.3	1.37	0.56	0.01	0.5
Year	**1364.5**	**3.74**	**1.71**	**0.03**	**0.5**

- Gim - Monthly sum of global irradiation (kWh/m2)
- Gid - Daily sum of global irradiation (kWh/m2)
- Did - Daily sum of diffuse irradiation (kWh/m2)
- Rid - Daily sum of reflected irradiation (kWh/m2)
- Shloss - Losses of global irradiation by terrain shading (%)

Global In-Plane Irradiation or Global Tilted Irradiation (GTI) is the total radiation that falls on a tilted surface. The GTI is an important parameter for PV system designers. PV modules may be installed on different mounting systems such as flat, tilted, 1-axis or 2-axis tracking, etc. For each mounting system, GTI is calculated individually.. (Geo Model Solar)

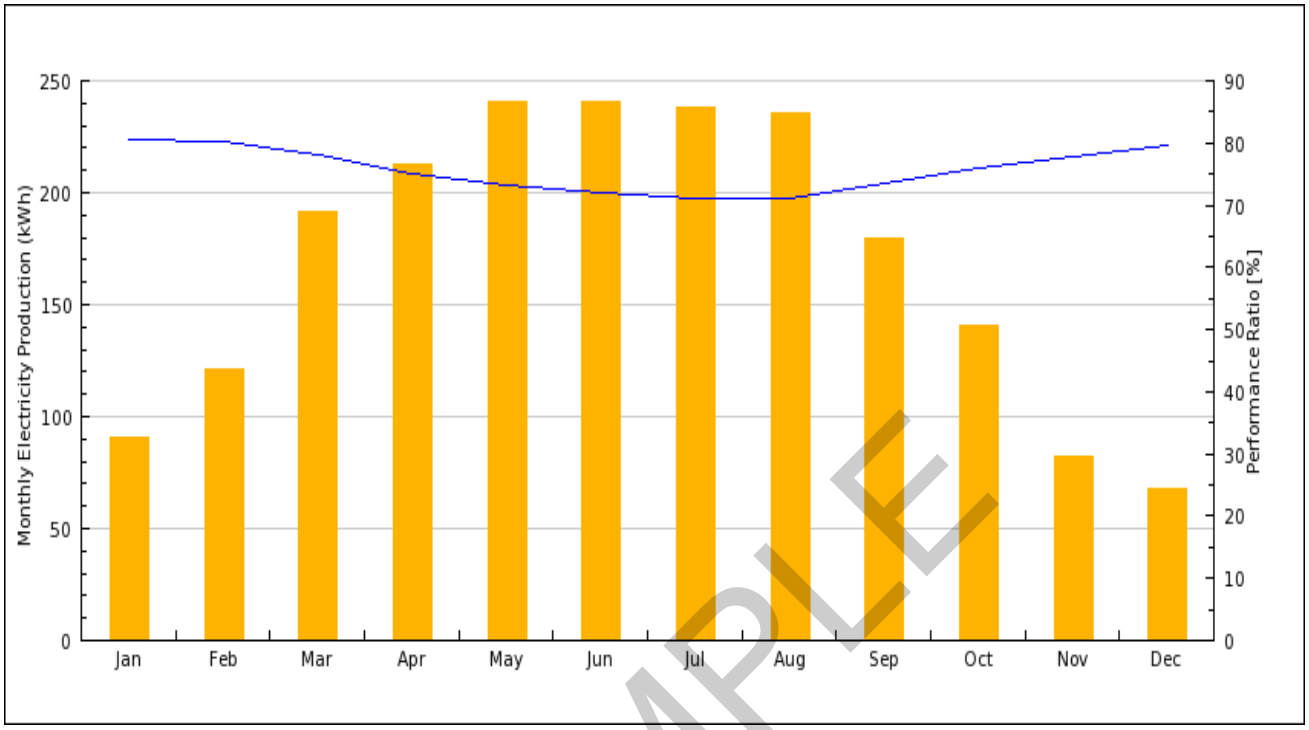
PV Electricity Production

Month	Esm	Esd	Etm	Eshare	PR
January	45.5	1.47	91.0	4.5	80.6
February	60.5	2.16	121.0	5.9	80.1
March	95.7	3.09	191.4	9.4	78.1
April	106.4	3.55	212.8	10.4	75.2
May	120.2	3.88	240.4	11.8	73.3
June	120.5	4.02	241.0	11.8	72.0
July	119.1	3.84	238.2	11.7	71.0
August	117.9	3.80	235.8	11.5	71.2
September	90.0	3.00	180.0	8.8	73.5
October	70.4	2.27	140.8	6.9	76.1
November	41.0	1.37	82.0	4.0	77.9
December	33.8	1.09	67.6	3.3	79.5
Year	**1021.0**	**2.80**	**2042.0**	**100.0**	**74.5**

- Esm - Monthly sum of specific electricity production (kWh/kWp)
- Esd - Daily sum of specific electricity production (kWh/kWp)
- Etm - Monthly sum of total electricity production (kWh)
- Eshare - Percentual share of monthly electricity production (%)
- PR - Performance Ratio (%)

PR - The Performance Ratio informs you as to how energy efficient and reliable your PV plant is. A PV system with high efficiency can achieve a PR of upto 80%.

Monthly Electricity Production VS Performance Ratio



Monthly Electricity Production

Performance Ratio

System Losses and Performance Ratio

Energy Conversion Step	Energy o/p (kWh/kWp)	Energy Loss (kWh/kWp)	Energy Loss (%)	Performance Ratio (cum %)
Global in-plane irradiation	1371			100.0
Global irradiation reduced by terrain shading	1365	-6	-0.45	99.6
Global irradiation reduced by reflectivity	1321	-43	-3.16	96.4
Conversion to DC in the modules	1219	-102	-7.75	88.9
Other DC losses	1152	-67	-5.5	84.1
Inverters (DC/AC conversion)	1037	-115	-10.0	75.6
Transformer & AC cabling losses	1021	-16	-1.5	74.5
Reduced availability	1021	0	0.0	74.5
Total system performance	**1021**	**-349**	**-25.49**	**74.5**

Energy conversion steps and losses:

1. Initial production at Standard Test Conditions (STC) is assumed,
2. Reduction of global in-plane irradiation due to obstruction of terrain horizon and PV modules,
3. Proportion of global irradiation that is reflected by surface of PV modules (typically glass),
4. Losses in PV modules due to conversion of solar radiation to DC electricity; deviation of module efficiency from STC,
5. DC losses: this step assumes integrated effect of mismatch between PV modules, heat losses in interconnections and cables, losses due to dirt, snow, icing and soiling, and self-shading of PV modules,
6. This step considers euro efficiency to approximate average losses in the inverter,
7. Losses in AC section and transformer (where applicable) depend on the system architecture,
8. Availability parameter assumes losses due to downtime caused by maintenance or failures.

Summary

SYSTEM
Installed Power (kW): 2
No of PV modules: 8
Mounting Type: Roof Mounted
Mounting system Tilt Direction: 180 S
Mounting System Tilt Degree: 30
Energy output (kWh): 1021
Performance Ratio (%): 74.5

Sources

1. The climate / meteorological data, system losses and the PV electricity production have been obtained by "Solar GIS PV Planner © Geo Model Solar."

Disclaimer and Legal Information

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The values obtained in this Pre-Feasibility report are to be used solely as a general guide. This report is intended to provide an estimate of what could potentially be the system technical / financial parameters. The actual values will vary depending on site conditions, system efficiencies, location and other factors. We recommend you to arrange for a qualified solar professional to undertake a detailed assessment of your site before proceeding with the installation of your solar system.

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