

# **Assessment of Rooftop Solar PV System in Knitted Apparel Cluster in Ludhiana**

**Submitted to**

***Apex Cluster Development Services Pvt. Ltd. (ACDS)***

**Submitted by**



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## List of ACRONYMS

SIDBI – Small Industries Development Bank of India  
ISTSL – India SME Technology Services Ltd.  
ACDS – Apex Cluster Development Services Pvt. Ltd.  
GOP - Government of Punjab  
SCL - Sanctioned Connected Load  
CD - Contract Demand  
PSPCL - Punjab State Power Corporation Limited  
PEDA – Punjab Energy Development Agency  
PMC – Project Management & Consultancy  
CAGR – Compound Annual Growth Rate  
kWp – Kilo Watt Peak  
kWh – Kilo Watt Hour (1 kWh = 1 Unit)



## ACKNOWLEDGMENT

India SME Technology Services Limited (ISTSL) places on record its sincere thanks to Apex Cluster Development Services Pvt. Ltd. for its role in guiding and steering this assignment for **“Assessment of Rooftop Solar PV System in Knitted Apparel Cluster in Ludhiana”**.

The Study team is indebted to **Mr. Rajveer Singh** and **Mr. B.P. Singh** for showing keen interest in the study and also thankful to the **Mr. Surinder Singh Bedi** for their wholehearted support and cooperation for the assessment of all the units, without which the study would not have steered to its successful completion.

It is well worthy to mention that the efforts being taken and the enthusiasm shown by all the plant personnel towards the assessment of solar feasibility was really admirable. We found all the personnel keen to implement the possible Solar PV System.

## EXECUTIVE SUMMARY

Use of solar energy would resolve the sustainability problem associated with conventional fuels used for power generation as these sources are non – exhaustible, non-polluting and relatively clean fuel.

This assessment study was carried out combining primary and secondary research, information collected from various sources as well as field visit to knit wear industries in Ludhiana. During the course of study, knit wear industries were visited to develop assess the probable installation capacity of solar PV rooftop grid connected system. A through literature review was carried out to study the central government as well as Punjab state government solar policy.

Based on the units visited in knitwear cluster, the MSME units were categorized into three categories based on the solar installation capacity of the units. Around 50% of knitwear units in Ludhiana were having installation capacity less than 50 kWp, 37.5% of units are having installation capacity in between 50 to 100 kWp and only 12.5% of units are having installation capacity greater than 100 kWp. The average installation capacity for less than 50 kWp, between 50 and 100 kWp and more than 100 kWp is 34 kWp, 64 kWp and 133 kWp respectively. In the knitwear cluster at Ludhiana, the installed capacity of the grid connected solar PV rooftop system is predominantly decided by three factors, namely, annual energy consumption, contract demand and availability of un shaded rooftop area. The study reveals that the availability of un shaded rooftop area becomes the final deciding factor to assess the installed capacity.

The study analyzed the total solar power potential of the knitwear cluster of Ludhiana is around **570 MWp** and due to that annual monetary savings for the industries of that particular cluster is Rs. 538 Crores, which leads to annual reduction in CO<sub>2</sub> emissions is **630,000 tones**. The financial viability of the grid connected PV solar rooftop based system for both “CAPEX and RESCO” model for the three categories of MSME units were projected.

Particulars	Installation capacity less than 50 kWp		Installation capacity between 50 to 100 kWp		Installation capacity more than 100 kWp	
	CAPEX	RESCO	CAPEX	RESCO	CAPEX	RESCO
Average installation Capacity (kWp)	34		64		133	
Annual Electricity Generation (kWh)	45,900		86,400		179550	
Annual Monetary Saving <sup>1</sup> (Rs. Lakh)	3.2	0.61	6.05	1.15	12.6	2.40
Life time monetary Saving <sup>2</sup> (Rs. Lakh)	80	38	151.3	72	315	149
Investment (Rs. Lakh)	18.7	-	35.2	-	73.2	-
Payback period (Years)	4.7	-	4.7	-	4.7	-
Annual reduction in tCO <sub>2</sub> emissions	37.6		70.9		147.2	

Note:

<sup>1</sup> Calculated based on field visit made to knit wear industries.

<sup>2</sup> Life time is considered as 25 years

The annual average solar irradiance of 5.23 kWh/m<sup>2</sup>/day at Ludhiana was calculated using PVsys software. Using the same software the average electricity generation per unit installed capacity was calculated as 1350 units per annum.



## Chapter # 1

### BACKGROUND

#### 1.1 About INDIA SME TECHNOLOGY SERVICES LIMITED (ISTSL)

**M/s India SME Technology Services Limited (ISTSL)** is a public limited company incorporated under the Companies Act 1956 on 17<sup>th</sup> November 2005. It is a Joint Initiative of Small Industries Development Bank of India (SIDBI) and four public sector banks including State Bank of India (SBI), Indian Bank, Oriental Bank of Commerce (OBC) and Indian Overseas Bank (IOB).

ISTSL is working closely with industrial units in the Micro, Small and Medium Enterprises (MSME) sector in the fields of Energy Efficiency (End to End Energy Efficiency (4E) Solutions), Measurement and Verification (M&V) Audits, Consultancy and Technology Advisory, Renewable Energy and Finance Syndication including Techno Economic Evaluation. ISTSL provides a platform where MSMEs can tap opportunities at the global level for new and emerging technology or establish business collaboration.

ISTSL provides Project Management & Consultancy (PMC) services to following ministries of Govt. of India for implementation of grid connected rooftop solar PV projects for cumulative capacity of 40 MW in their offices /institutions:

- a) Ministry of MSME
- b) Ministry of Earth Sciences
- c) Ministry of HRD
- d) Ministry of Panchayati Raj
- e) Ministry of Food Processing Industries

Out of this, projects aggregating 500 kW have been implemented and electricity generation has commenced. Projects for around 25 MW is in various stages of implementation. These projects will result in annual electricity generation of more than



31.7 Million kWh and GHG offset of around 26,000 tCO<sub>2</sub> /year. Apart from above ministries, ISTSL is also motivating MSME units in various clusters to adopt Solar rooftop PV systems. ISTSL is also rendering Lender's Engineer service for SIDBI's Loan scheme for financing small solar PV Rooftop projects (for existing MSME units) in Faridabad Cluster.

ISTSL's core team is comprised of accredited and certified energy auditors with extensive experience in Energy Efficiency and Renewable Energy. India SME Technology Services Limited (ISTSL) has strong expertise working with MSMEs and implementation of rooftop solar PV projects.

## **1.2 Objectives of the Study**

ISTSL to carry out the feasibility study on "Assessment of Rooftop Solar PV System in Knitted Apparel Cluster in Ludhiana", the scope of study will be as follows:-

- (a) Understanding general structure of Power Usage (different type) in knitwear units in Ludhiana
- (b) Feasibility of Solar Power with limitations
- (c) Optimizing the use of Solar Power based on different process used in a typical knitwear unit
- (d) Rate of Investment (RoI) in different model / different sizes of Rooftop PVs
- (e) Recommendations with step wise process for implementation

The assessment is based on interactive discussion as well as field visit to 8 participating units located at Ludhiana and the details collected through secondary research as detailed below in succeeding sections.

### 1.3 Description of Cluster

The knitwear industry is well diversified in our country. Ludhiana is famous for woollen, acrylic and acrowool / blended wool knitwear. About 90 per cent of India's acrylic / woollens are manufactured at Ludhiana. Over a period of time, Ludhiana also emerged as a producer of summer wear from knitted polyester / cotton or blended fabrics. There are about 11,000<sup>[1]</sup> active MSMEs engaged in the manufacture of various knitted items.

Major products of these industries are:

- a) Summer Wear
- b) T shirts
- c) Knitted bed sheets
- d) Woollen Wears

Material process flow diagram of a typical knitwear industry is shown in the process flow chart:

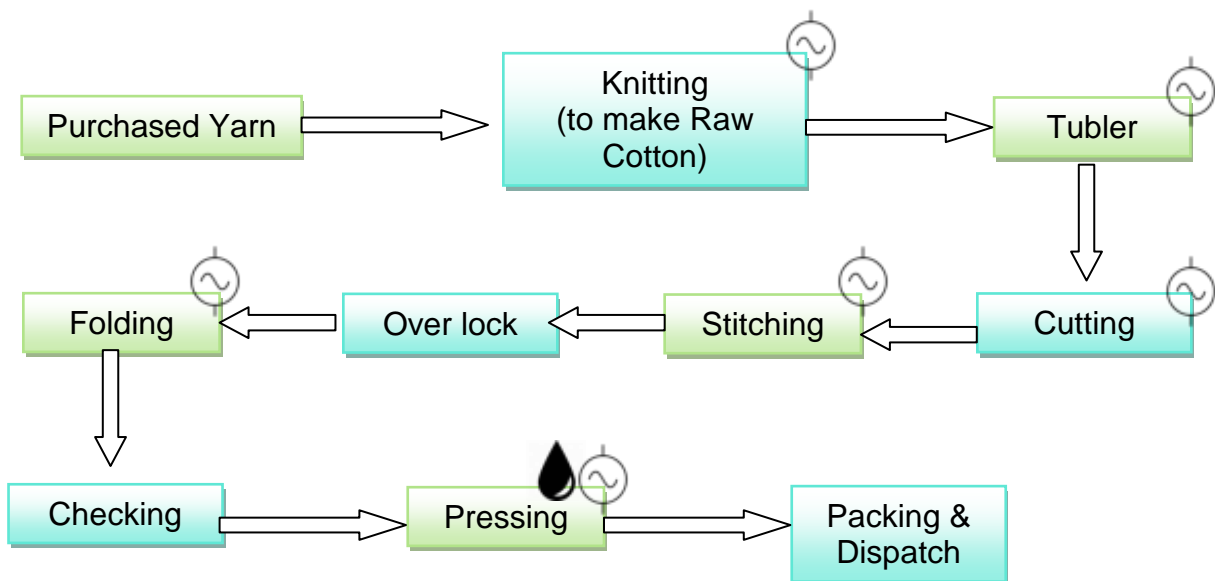




Figure 1: Process Flow Chart

Notation used:

-  Use of electrical energy
-  Use of thermal energy

Major energy consumption of these units is electrical energy some of the composite units have both electrical as well as thermal energy consumption.

### Geographical Information

Latitude - 30.90 °N

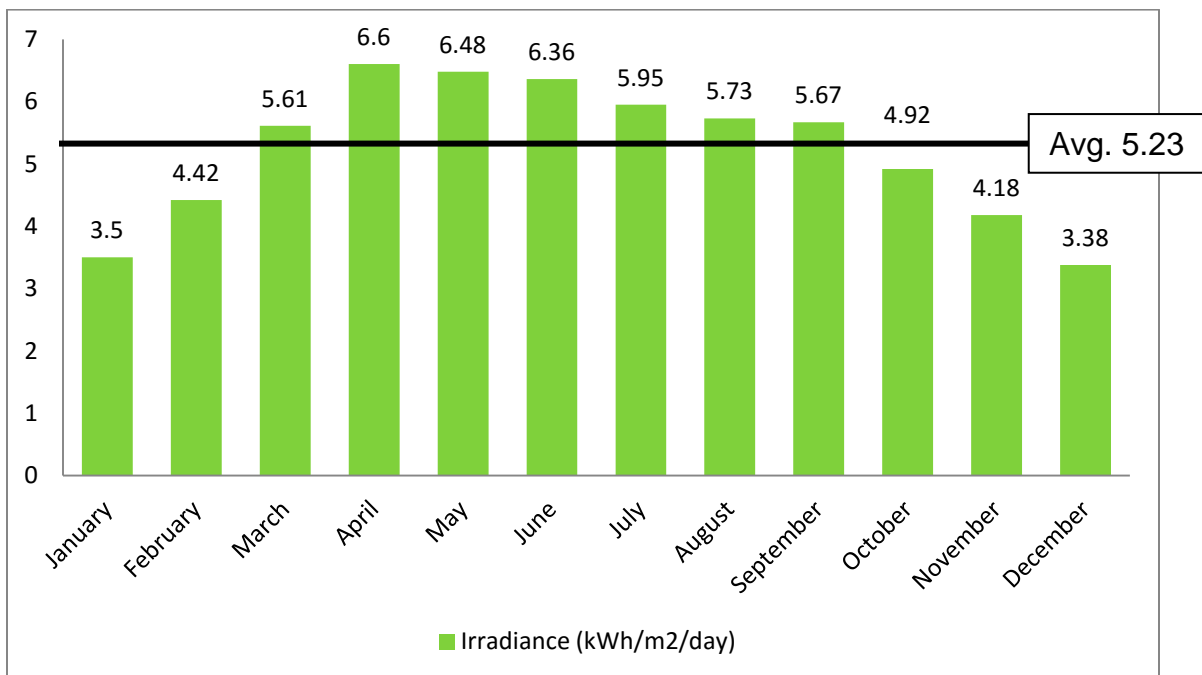
Longitude - 75.85 °E

### Solar Irradiance in Ludhiana

#### Average Direct Normal Irradiance

The solar radiation data of the Ludhiana is a typical year representative of 20 year average. An actual year could vary depending on the annual rainfall and cloud cover for the particular year. However, over the long term average the data will tend to follow the trends represented by the NASA data set<sup>[2]</sup>. The **annual average irradiance of 5.23 kWh/m<sup>2</sup>/day** is also verified from the software PV Sys. It should be noted that seven months the solar irradiance in Ludhiana is higher than the average value noted.

Graph 1: Monthly Average Solar Irradiance



## Chapter # 2

### Approach and Methodology

#### 2.1 Primary Research

##### 2.1.1 Rationale of Selecting the Project Sites

Eight knitwear industries were selected based on criteria to ensure that salient features of grid connected solar PV rooftop projects can be captured, collect all the information about the cluster and sampling was taken using scientific techniques. The industries selection for the projects was based on following criteria:

- Based on the type of Production (MT) and finished products.
- Based on the Annual Energy Consumption
- Based on the Contract Demand of the industry

##### 2.1.2 Data Collection and Site Survey

A holistic and professional approach has been adopted to analyze and assess the infrastructure and feasibility of a roof top solar PV system with the help of detailed questionnaire and site visit by the technical team. Industries were critically examined on the basis of various parameters for the installation of rooftop solar PV system.

Some of the important parameters considered are:-

1. Contract Demand (kVA)
2. Annual Energy Consumption
3. Un shaded roof Area
4. Type of Roof
5. Type of Finished Product
6. Annual Production (MT)

Summary of the data collection of site visit is shown in Annexure # 1.

### **Load Profile**

The primary data of importance in case of solar project is the Contract Demand and Annual Energy Consumption.

Contract Demand is one of the most critical parameter that has to be considered. It is the amount of power which unit agrees to pay to have available at all times. Because this refers to power which must be made available, as opposed to energy which can be consume. As per existing net metering policy in Punjab State, the maximum capacity of the grid connected solar PV rooftop system shall not be more than 80% of the contract demand.

To assess the installed capacity of grid connected solar PV rooftop system the present annual energy consumption were captured as it is an important parameter to decide the installed capacity of solar PV system.

### **Roof Structure and Un shaded Area**

It is important to understand the structure of the roof i.e., RCC rooftop, tin shade or asbestos sheet for understanding the actual capacity of the rooftop solar PV system.

Shade free area is the actual area suitable for the installation of PV modules. This is the area obtained by excluding the shaded areas on the rooftop. We have to consider shading objects such as cooling towers, ventilation of chillers and ACs, water tanks etc. and exclude the rooftop area around these objects while measuring the 'shade free area'.

### **Finished Product and Annual Production**

This parameter should also be considered while deciding the capacity because it is very important to know the process and product type of the industries.

## 2.2 Secondary Research

### 2.2.1 Government Policy

#### SOLAR POLICY

##### **Central Policy** <sup>[3]</sup>

The Government of India is implementing a 'Grid Connected Rooftop and Small Solar Power Plants Programme' in which the solar rooftop plants from 1 kWp to 500 kWp capacities are set up. The ministry has set a target for installation of 100 GW solar power of which 40 GW is to come from grid connected solar rooftop plants. Details of the Central Government Policy is described in Annexure # 2

##### **Punjab Government State Policy** <sup>[4]</sup>

As the state is endowed with vast potential of solar energy estimated at 5.23 kWh/m<sup>2</sup> of solar radiation levels and the Punjab government is also keen to tap this resource. Government of Punjab has already notified NRSE policy 2012 which, provides for encouraging solar power generation to harness vast solar potential in state and to promote stand alone rooftop PV system to achieve installed capacity of 1000 MW by the year 2022. Detailed description of Punjab Government State policy is mention in the Annexure # 3

##### **Net Metering**

Under net metering policy of Punjab Government, all consumers of electricity having minimum sanctioned load of 1.25 kW and maximum 12.50 MW who intend to generate their own electricity and desire to contribute towards environmental protection can install Solar PV plants on roof top / open area of industries, commercial establishment and household etc. Under net metering policy, solar PV plants of capacity ranging from 1.0 kW to 10 MW can be installed. The maximum capacity of solar power plant to be installed would be 80% of the contract demand.

Net metering is a billing mechanism approved by the state of Punjab wherein, the energy produced by the solar energy plant is directly fed into the grid. For example, if a

customer has a PV system on their rooftop, it may generate more electricity than the home / business uses during daylight hours. If the site is net-metered, the electricity meter will be replaced with a bi-directional electricity meter which along with keeping track of energy generated will also keep track of energy consumed customers are only billed for their "net" energy use.

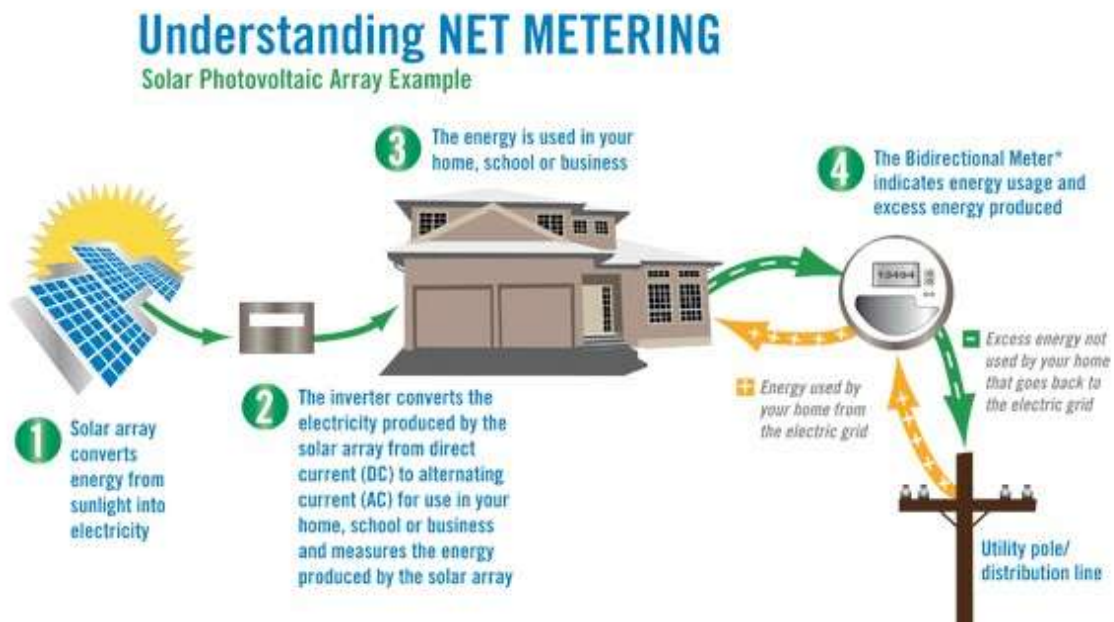


Figure 2: Net Metering System

### 2.2.2 Solar PV System

Solar Power Plant comprises of the mainly following equipment and components:

- a Solar PV Modules
- b Inverters
- c Module Mounting System
- d Monitoring System
- e Cables and Connectors

#### Solar PV Modules

PV system convert energy from the sun directly into electricity. Their basic component is the solar cell. Solar Cells are diodes: they combine two (or more) layers of semiconductor materials whose properties are manipulated in such a way as to create

permanent electric field across the junction of the two layers. When photons strike the solar cell, they excite electrons in the semiconductors. Some of these electrons get carried across the (p-n) junction by the electric field and make their way to the conducting contacts at the top of the cell. If the cell is connected to a load, these electrons will flow through the circuit and supply power to the load. The power generated is, in general, proportional to the amount of sunlight received by the solar cell.

Solar cells are the building blocks of a solar panel. Solar cells are joined together to make one solar panel at peak power production. Front side of module is covered by tempered & textured clear glass with low iron content resulting in efficient sunlight absorption. Back side is covered by EVA potent sheet to provide maximum protection from the severest environmental conditions. High torsion and corrosion resistant anodized aluminum frame provides structural strength and ease of installation. The junction box of the module is located back side. In each module junction box there are two terminal both (-) ve & (+) ve terminal. To minimize the loss in output when shading occurs a bypass diodes which is connected to out terminal of the module. The aluminum frame of module contains hole in suitable position for mounting.

A photovoltaic module is a packaged interconnected assembly of photovoltaic cells, which converts sunlight into energy. Poly crystalline (c-Si) type of solar module of 300/320 Wp is considered. A photovoltaic module is the main important component of the Solar Photovoltaic Power Plant.



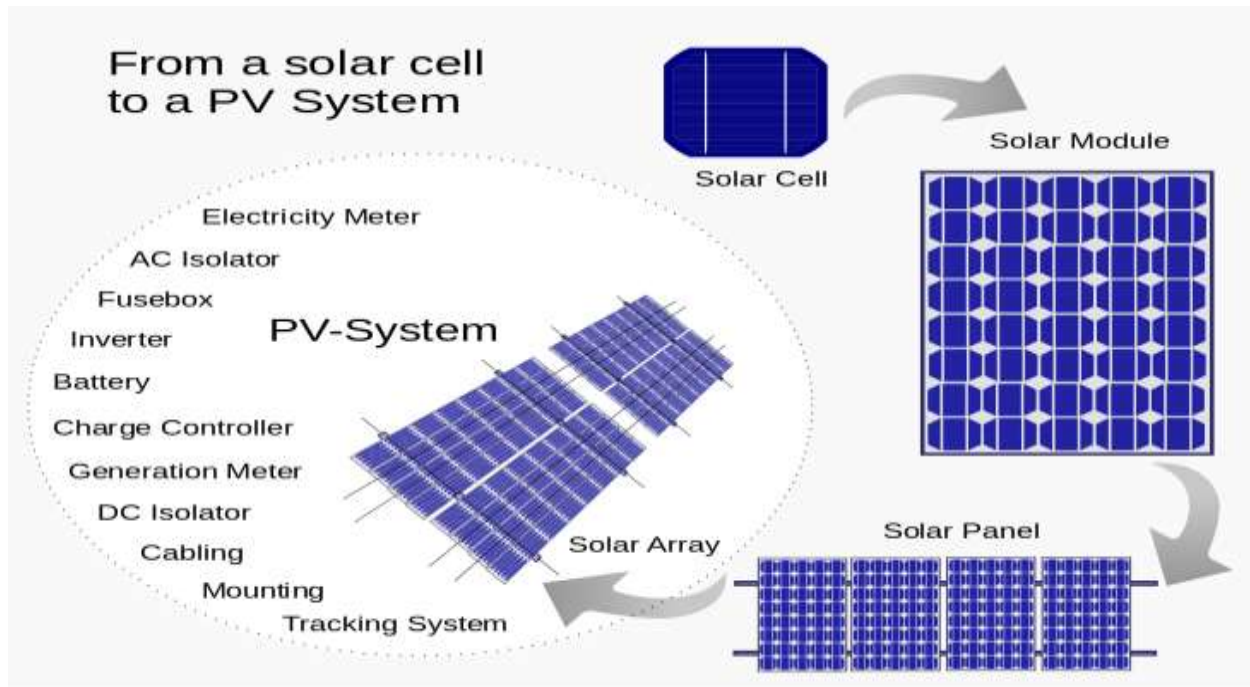


Figure 3: Solar PV Modules

### Specifications & Details

Specification	BASIC
Panel Type and Wattage	Polycrystalline 300W Panels
Module Efficiency %	15.48%
Power Warranty	25 Years
Product Warranty	10 Years
Degradation per year	0.8%
Cell Type	Multicrystalline 6 inch
Cell Arrangement	60 (6 x 10)
Dimensions	1639 x 982 x 40mm (64.5 x 38.7 x 1.57inch)
Weight	18.5 Kgs
Frame Material	Anodized Aluminium Alloy

## **Inverters**

The direct current generated by the solar cells is converted to grid compatible alternating current by the inverter. It is therefore the link between the solar modules and the electricity grid.

### **Central Inverter**

Central inverters are particularly suitable for building up photovoltaic systems with a homogenous structure (modules of the same type with an identical alignment and inclination). They are used for installations from 100 kW upwards and, in most cases, are designed for outdoor installation.

### **String Inverter**

In string technology, the photovoltaic generator is subdivided into individual module surfaces and each of these individual “string” has its own string inverter allocated to it. This technology allows the system cost to be reduced while at the same time making installation a lot easier and increasing the energy yield and system availability.

Grid connected inverters have higher power factor, better transient current suppression; short circuit current is limited to rated AC current. The grid connected inverter range is the state of the art equipment with robust control platform, high efficiency.



**Figure 4: Inverter**

## **Cables & Wires**

The cables and wires used are according to the Government norms and regulations, copper wires are used for connections and connectors are used for a lossless system.

The cables used in the system should be ISI marked PVC or XLPE insulated FRLS armoured copper conductor. The permissible voltage drop from the SPV generator to the charge controller/inverter shall not be more than 2% of peak power voltage of the SPV power source.

The Cables and Wires are sized according to current rating and are used accordingly, cable sizing is done in the pre-execution phase of System Designing wherein System Losses are crucial and are tackled with appropriate wire size and make. The design phase also pays utmost importance to standards and certifications of the cables for System and Load Protection.

### **2.2.3 Different Models of Rooftop Solar PV**

#### **On – Grid Solar**

**Definition:** On-Grid Systems are solar PV systems that only generate power when the utility power grid is available. They must connect to the grid to function. They can send excess power generated back to the grid when you are overproducing so you credit it for later use.

**Benefits:** These are simplest systems and the most cost effective to install. These systems will pay for themselves by offsetting utility bills in 3-6 yrs.

**Downside:** These do not provide power during a grid outage.

**Conclusion:** They are cost effective enough to pay for themselves and put money in your pocket long term.

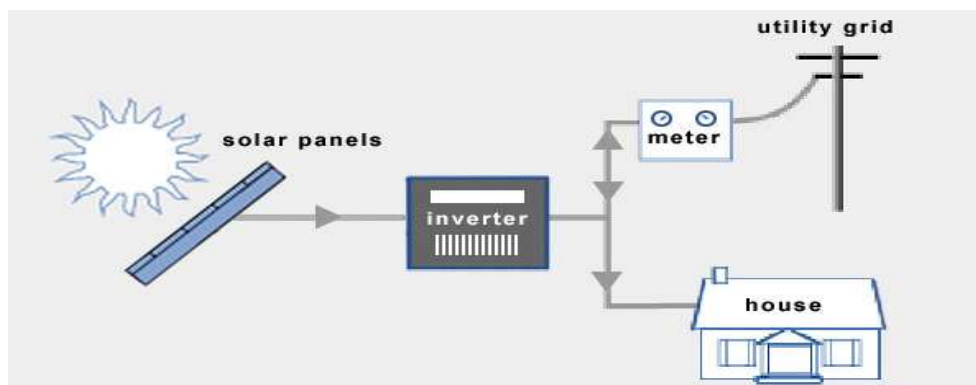


Figure 5: On Grid System

## Off – Grid Solar

**Definition:** These systems allow you to store your solar power in batteries for use when the power grid goes down or if you are not on the grid. Hybrid systems provide power to offset the grid power whenever the sun is shining and will even send excess power to the grid for credit for later use.

**Benefits:** Provides power for your critical loads when the power grid is down.

**Downside:** Cannot be expected to provide power for all your loads since the cost and volume of batteries would be prohibitive. Off-Grid systems require a lot more specialized equipment to function that is more costly and more complex to install. Specifically they require a central/string inverter, a charge controller as well as a batteries.

Sizing the solar array and the batteries required is complex. Detailed analysis of requirements will be needed to provide for minimal critical needs. That will also need to rewire you main electrical panel to isolate the "critical loads" so that only they are provided power in an outage. Also, batteries are expensive, require ongoing maintenance and periodic replacement.

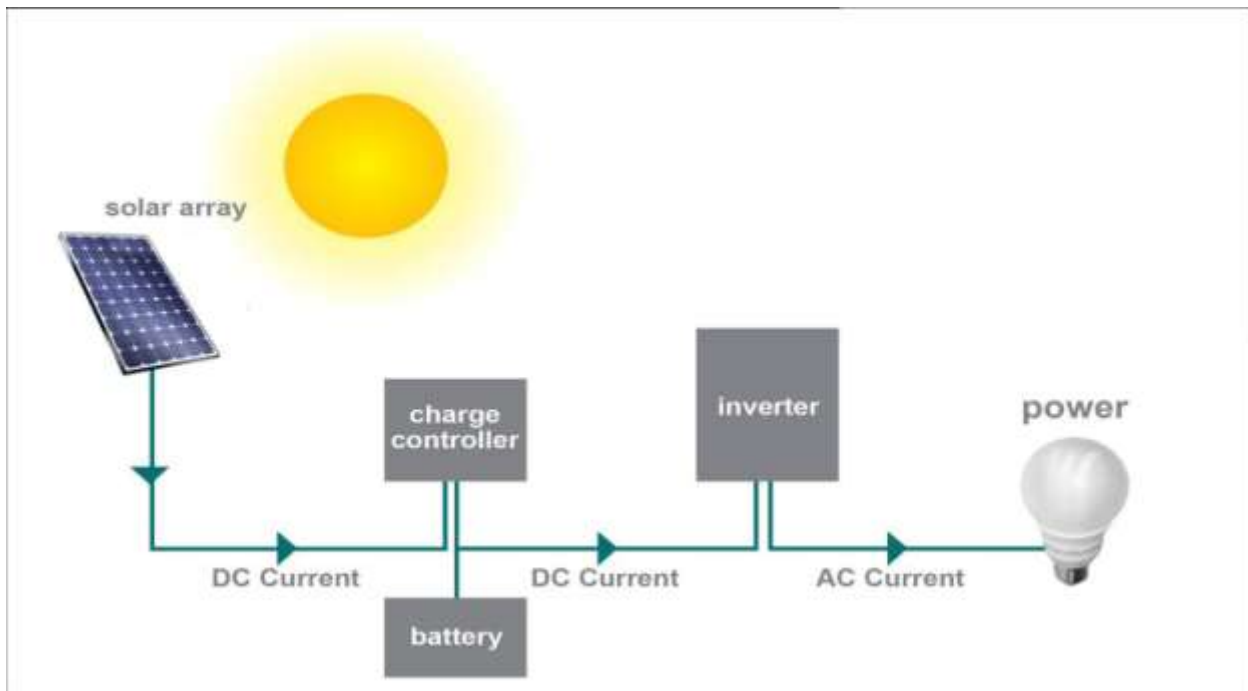


Figure 6: Off Grid System

## 2.2.4 Modes of Implementation of rooftop Solar PV

**CAPEX Model:** Here, the entire system is owned by the rooftop owners. Responsibility of O&M for the system lifetime (25 years) is also with the rooftop owner. Developer is responsible for installing the system and initial 5 years O&M. In this case, the developers are selected through a system cost-based reverse bidding.

**RESCO Model:** Here, the entire system is owned by the developer. Responsibility of O&M for the system lifetime (25 years) is also with the developer. Rooftop owners may consume the electricity generated, for which they have to pay a pre-decided tariff on a monthly basis. Excess generation may be exported to the grid, subject to availability of requisite state regulations. In this case, the developers are selected through a tariff-based reverse bidding.

### Suitability of Both the Models

For consumers that have adequate manpower/expertise for O&M, rooftop access concerns, availability of funds upfront, CAPEX model is better. Consumers in states that have net-metering regulations can take benefit of the same in case they have substantial excess generation.

On the other hand, consumers who prefer not to take responsibility for the system O&M, do not have rooftop security concerns and prefer to pay on a monthly basis rather than bulk upfront payment may choose to go for RESCO model.

### **2.2.5 Other Issues**

#### **1. Natural Degradation**

All solar cells naturally degrade over time, regardless of the environment they are in.

#### **2. Grounding & Lightning Protection**

There are multiple aspects of PV system that one must account for to create an effective lightning protection system. The first is to create some form of grounding system to redirect the energy from the lightning into the ground.

#### **3. Panel Cleaning**

It is important over the lifespan of an array to maintain optimal energy output. In order to accomplish this, panel cleaning will be necessary. As in the textile industries there is substantial amount of cotton dust in the environment that dust will accumulate on the PV panels. Due to this generation will be less compared to the expected generation. So, it is recommended to clean the PV panels on regular basis.

### **2.2.6 List of Probable Suppliers <sup>[5]</sup>**

Details of Empanelled Manufactures/System integrators for roof top grid connected SPV Power Plants for different capacities has been provided in Annexure # 6.

## Chapter # 3

### Technical & Financial Feasibility

Using site specific solar data, annual energy production (kWh) and the peak production (kWp) has been estimated. The analysis includes potential variations in these parameters and addresses the following:

1. Optimal solar power plant size at the site and existing electricity utility rates.
2. Approximate capital costs and operation & maintenance (O&M) cost.

#### 3.1 Technical Feasibility

For installing rooftop solar photo voltaic system these points should be followed:-

1. Maximum limit of installation on the basis of C.D.
2. Net Metering Policy of State
3. Un shaded Area

To assess the feasibility of installed capacity of the grid connected solar PV rooftop system is decided by the decision flow chart provided below.

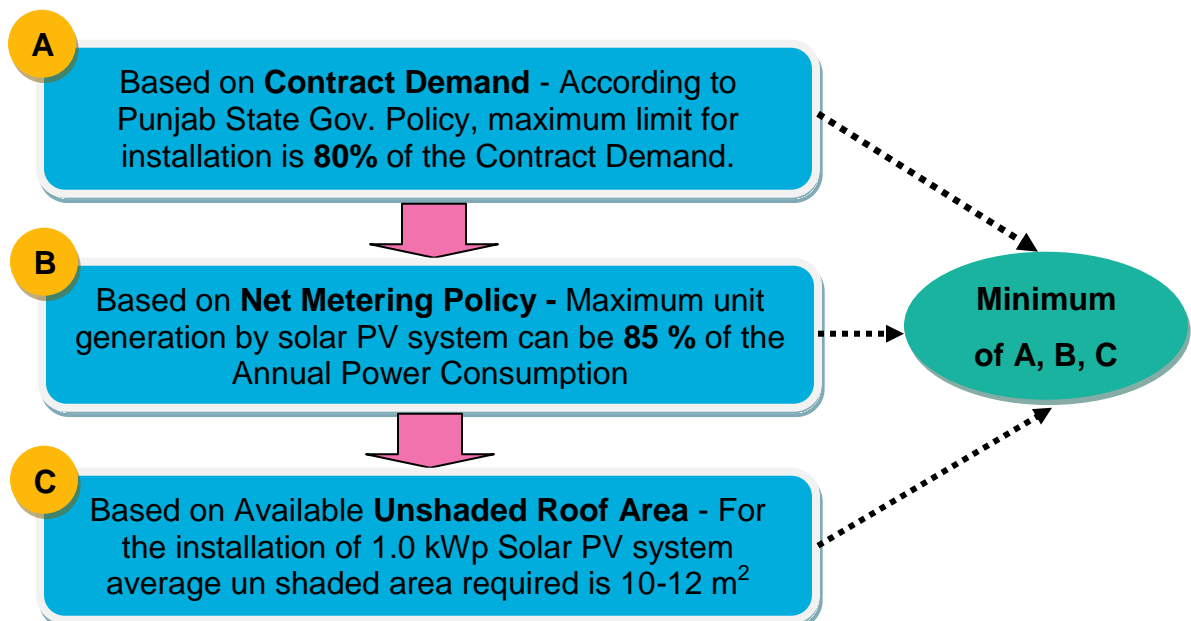


Figure 7: Decision Flow Chart to assess PV system installed capacity

Technical feasibility of the solar rooftop installation of all the units is summarized in the Table # 1

**Table 1: Effective Installation Capacity of Solar PV**

Unit name	Effective grid connected solar PV rooftop capacity (kWp) based on			Net Capacity (kWp)	Annual Electricity Generation from Solar PV (kWh)	Annual Electricity consumption (kWh)	Potential for Power Generation (%)
	Annual Energy Consumption	Contract Demand	Rooftop <sup>1</sup>				
(A)	(B)	(C)	(D)	(E) <sup>2</sup>	(F)	(G)	(H) = (G) / (F)
Sungrace Fabrics	175	79.7	34	34	44,370	2,61,575	17.0 %
Amit Enterprises	574	544	48	48	62,640	8,61,247	7.3 %
Aadi Knit Works	653	400	34	34	44,370	9,79,489	4.5 %
Kudu Knit Works	2115	1196	133	133	173,565	31,73,200	5.5 %
Nivea Knit Tech	66	80	62	62	80,910	99,038	81.7 %
Singla Knit Wear	104	85	60	60	78,300	1,55,693	50.3 %
Ludhiana Knit Tech	1646	392	70	70	91,350	24,69,744	3.7 %
S.J. Fabrics	128	71	20	20	26,100	1,91,236	13.6 %

Note:

<sup>1</sup> Available unshared area

<sup>2</sup> Net capacity is assessed based on minimum of (B), (C) and (D)

Based from the data collection from the site, it can be concluded that basic constraint for the installation of rooftop Solar PV system in Knit wear industries is the availability of the un shaded roof area. From the above table, it can also be concluded that average potential of power generation from solar PV system is **8.6%** of annual energy consumption of unit. Since the available un shaded roof area for the Unit M/s Nivea Knit



Tech and M/s Singla knitwear is large and their power consumption is comparatively low so, they are excluded from the average of the potential for power generation.

So, based on the availability of the un shaded roof area all the units of knitwear cluster can be further segregated into three categories on the basis of net capacity of installation of Solar PV system

- a) Units having net capacity of installation **less than** 50 kWp.
- b) Units having capacity of installation **between** 50 kWp and 100 kWp.
- c) Units having capacity **greater than** 50 kWp.

### 3.2 Financial Feasibility

There are two models of implementation of solar rooftop PV system i.e., CAPEX & RESCO Model.

- **CAPEX Model**

It can be concluded that average installation capacity for the 8 units visited is **58 kWp** and annual monetary saving is **Rs. 5.45 Lakh** and the payback period for the same is around **4.7 years**. It can also be noted from the Table # 2, higher the Average Rate (Rs / Unit) lower will be the Payback period (refer table 2).

Financial viability on the basis of CAPEX model is summarized in the Table # 2

**Table 2: Financial Viability on the basis of CAPEX Model**

Unit Name	Net Capacity (kWp)	Avg. Rate (Rs/Unit)	Annual Electricity Generation (kWh)	Annual Monetary Saving (Rs. Lakh)	Implemented Cost (Rs. Lakh)	Payback period (Years)*
Sungrace Fabrics	34	6.6	45900	3.03	18.7	5.1
Amit Enterprises	48	7.5	64800	4.86	26.4	4.4
Aadi Knit Works	34	7.3	45900	3.35	18.7	4.5
Kudu Knit Works	133	7.5	179550	13.47	73.15	4.4
Nivea Knit Tech	62	7.0	83700	5.86	34.1	4.7
Singla Knit Wear	60	6.6	81000	5.35	33	5.1
Ludhiana Knit Tech	70	7.0	94500	6.62	38.5	4.7
S.J. Fabrics	20	6.6	27000	1.78	11	5.1
<b>Average</b>	<b>58</b>	<b>7.0</b>	<b>77794</b>	<b>5.45</b>	<b>31.2</b>	<b>4.7</b>

\* Payback period is calculated on the basis of accelerated depreciation, tax benefits on accelerated depreciation and contingency.

- **RESCO Model**

In RESCO Model, it can be concluded that average annual monetary saving is **Rs. 1.03 Lakh** and for the period of 25 years it is **Rs. 65.0 Lakh** without any investment of Rooftop Owners.

Financial viability on the basis of RESCO model is summarized in the Table # 3

**Table 3: Financial Viability on the basis of RESCO Model**

<b>Unit Name</b>	<b>Net Capacity (kWp)</b>	<b>Annual Electricity Generation (kWh)</b>	<b>Annual Monetary Saving (Rs. Lakh)</b>	<b>*Net Saving at the end of 25 Years (Rs. Lakh)</b>	<b>Reduction in tCO<sub>2</sub> /year emissions</b>
Sungrace Fabrics	34	45900	0.43	32.0	37.6
Amit Enterprises	48	64800	1.19	64.0	53.1
Aadi Knit Works	34	45900	0.75	43.0	37.6
Kudu Knit Works	133	179550	3.23	178.0	147.6
Nivea Knit Tech	62	83700	1.11	69.0	68.6
Singla Knit Wear	60	81000	0.75	57.0	66.4
Ludhiana Knit Tech	70	94500	1.26	78.0	77.5
S.J. Fabrics	20	27000	0.25	22	22.1
<b>Average</b>	<b>58</b>	<b>77794</b>	<b>1.03</b>	<b>65.0</b>	<b>63.8</b>

\* Net Saving at the end of 25 Years is calculated by taking compound annual growth rate (CAGR) of average rate of Rs per unit at the rate of 2%.

According to the site survey, it is estimated that 50% of the units are under the installation capacity less than 50 kWp, 37.5 % of the units come under the category of installation capacity between 50 kWp to 100 kWp remaining 12.5% of the units come under the category of installation capacity greater than 100 kWp.

Financial viability on the basis of CAPEX model and RESCO model for different category is summarized in the Table # 4 & Table # 5.

**Table 4: Financial Viability on the basis of CAPEX Model for different category**

Knitwear Units with capacity	Net Capacity (kWp)	Annual Electricity Generation (Lakh kWh)	Annual Monetary Saving (Rs. Lakh)	Implemented Cost (Rs. Lakh)	SPP (Years)
less than 50 kWp	34	45,900	3.2	18.7	4.7
between 50 to 100 kWp	64	86,400	6.05	35.2	4.7
greater than 100 kWp	133	179,550	12.60	73.2	4.7

**Table 5 : Financial Viability on the basis of RESCO Model for different category**

Knitwear Units with capacity	Net Capacity (kWp)	Annual Electricity Generation (kWh)	Annual Monetary Saving (Rs. Lakh)	Net Saving at the end of 25 Years (Rs. Lakh)	Reduction in tCO <sub>2</sub> /year emissions
less than 50 kWp	34	45,900	0.61	38	37.6
between 50 to 100 kWp	64	86,400	1.15	72	70.8
greater than 100 kWp	133	179,550	2.40	149	147.2

In CAPEX model average payback period of solar PV installation is **4.7 years** and annual monetary saving is of Rs. **5.0 Lakh** and in RESCO model annual monetary saving is of **Rs. 1.03 Lakh** and lifetime saving is of **Rs. 65 Lakh**

Since 50 % of Knit wear units in Ludhiana having installation capacity less than 50 kWp, 37.5 % of units are having installation capacity in between 50 to 100 kWp and 12.5 % of units are having installation capacity greater than 100 kWp.

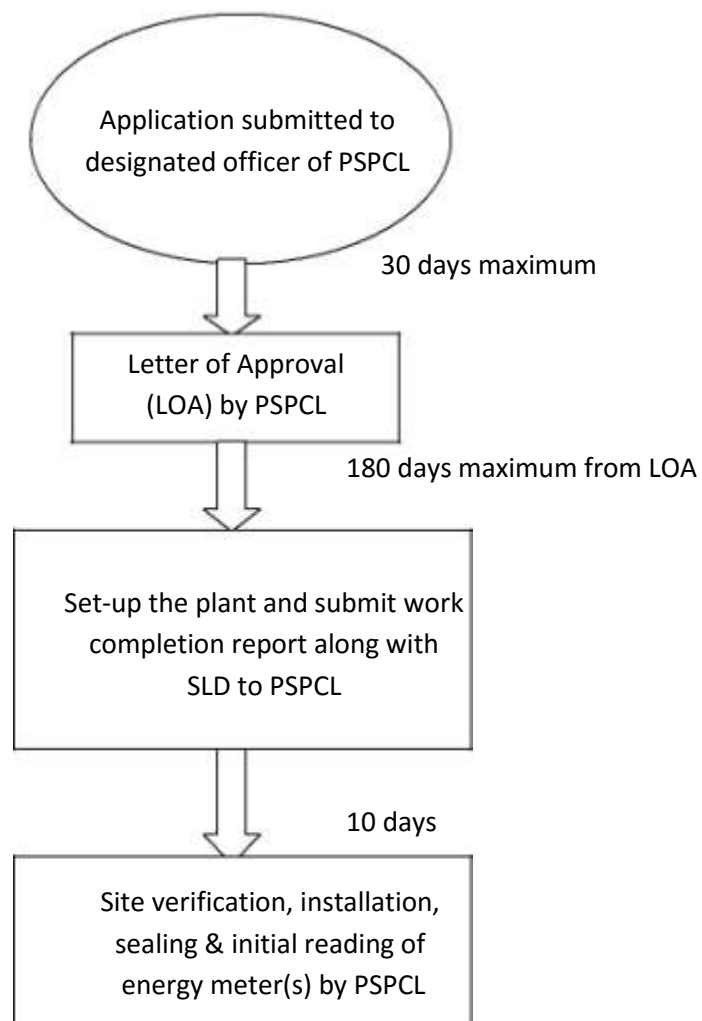
Based on the data collection of site survey it is analyzed that total Solar Potential for Knit Wear Apparel cluster in Ludhiana is huge amount i.e., around **500 MWp** and the annual reduction in tCO<sub>2</sub> is **630,000** tones. This will lead to reduce the load on the grid supply.

## Chapter # 4

### Conclusions & Recommendations

Solar Energy projects in MSME can play an important role in addressing energy issues in the industries i.e., energy deficit and cost of energy. Solar energy can contribute to both grid interactive and off grid provisioning in India. Promoting solar energy will lead to economic growth of the industries by reducing the energy cost of the industries.

Net metering system for the installation of Solar PV in Punjab state is one of the important factor to be considered. For the installation of net metering system, MSME unit of Ludhiana has to follow this measure:



Installation capacity based on the availability of un shaded roof area varies according to the different categories,

Average solar PV installation capacity for the first category (less than 50kW) is around 34 kWp, for second category installation capacity is of 64 kWp and for the third category average capacity is of 133 kWp.

CAPEX Model is the most common business model for rooftop solar where a consumer pays 100% of the PV system cost upfront. Since the installation capacity of Knit wear units is very small, so for those units it is preferable to opt for CAPEX Model because the payback period for the installation of the solar system is of **4.7 years** and annual monetary saving is about **Rs. 5.0 Lakhs**. The key advantage of this model is that it allows industrial owners to own the system and have the benefits of that system.

Under the RESCO model, a third party company finances, installs, operates and maintains the rooftop solar panels. If the industry having common consensus opt for bundling the installation capacity and that capacity should be more than 500 kWp solar PV System, then they can opt for RESCO model. In RESCO model annual monetary saving is around **Rs. 1.03 Lakhs** and for a period of 25 years saving is amounting to **Rs. 65.0 Lakhs**

It is recommended to install solar PV system in order to reduce electricity bill and conserve energy. In order to install rooftop Solar PV system industries can go to several method of implementation.

Some of the methods of implementation are:-

#### 1. **Self Implementation**

In this method industry can contact to the suppliers directly (suppliers list given in Annexure # 6) and install solar PV system on their Rooftop.

#### 2. **Combined Implementation**

In this method industries having common consensus of units, they can opt for 3<sup>rd</sup> Party like PMC service providers for aggregating the installation capacity, that PMC service provider will go for tendering and through tender reliable suppliers will be selected.

Supplier will install solar PV system on their Rooftop. PMC service providers will ensure that suppliers are following technical standards provided by them and also ensure quality of work.

There are around 11,000 units under Knit Wear Cluster of Ludhiana, from the field study of different types of units it can be concluded that there are around 50% of MSMEs having solar installation capacity of less than 50 kWp, 37.5% and 12.5% of MSMEs having installation capacity of in between 50 kWp to 100 kWp and greater than 100 kWp respectively. This result to total solar potential of this cluster in Ludhiana is around **570 MWp** and due to this annual monetary saving of Knit Wear Apparel unit will be of Rs. 538 Crores and payback period of that investment will be around **4.7 years** which leads to total reduction in tCO<sub>2</sub> emission will be **630,000 tones of CO<sub>2</sub>**.

## Annexure 1: Summary of Site Visit

### Summary of Site Visit

Sl. No.	Particulars	Site # 1	Site # 2	Site # 3	Site # 4	Site # 5	Site # 6	Site # 7	Site # 8
1	Unit Name	Nivea Knit Works	Sungrace Fabrics	S.J. Fabrics	Singla Knit Wear	Ludhiana Knit Tech	Kudu Knit Process	Amit Enterprises	Aadi Knit Fab
2	Finished Product (MT)	Ready Made Garment	Knitted Fabric	Knitted Fabric	Ready Made Garment	Knitted Fabric	Knitted Fabric, Sports Wear	Knitted Fabric	Ready Made Garment
3	Contract Demand (kVA)	99.8	99.6	88.86	106.86	490	1495	680	500
4	Annual Energy Consumption (kWh)	99,038	261575	191235	155,693	2469744	3173200	861247	979489
5	Average Unit Rate (Rs/Unit)	6.6	6.6	6.6	6.6	7.03	7.5	7.5	7.3
6	Roof Type	RCC	RCC	RCC	RCC	Tin Shed	RCC	RCC	RCC
7	Un shaded Area	620 m <sup>2</sup>	250 m <sup>2</sup>	200 m <sup>2</sup>	600 m <sup>2</sup>	350 m <sup>2</sup>	1330	481 m <sup>2</sup>	335 m <sup>2</sup>
8	Lattitude/Lon gitude	30.95 / 75.85	30.94 / 75.85	30.93 / 75.87	30.94/ 75.86	30.95/ 75.86	30.95 / 75.86	30.94/ 75.85	30.94/ 75.85
9	Estimated System Capacity (kWp)	62	25	20	60	35	133	48	34





## Annexure 2: Central Government Solar Policy

No. 03/88/2015-16/GCRT  
Government of India  
Ministry of New and Renewable Energy  
(Solar Energy Group)  
\*\*\*

Block No. 14, CGO Complex,  
Lodhi Road, New Delhi,  
Dated: 04.03.2016

To  
The Pay and Accounts Officer  
Ministry of New and Renewable Energy  
Government of India, New Delhi

**Subject: Grid Connected Rooftop and Small Solar Power Plants Programme – Scaling-up of budget from Rs. 600 crore during the 12<sup>th</sup> Five Year Plan to Rs.5000 crore for implementation over a period of five years upto 2019-20 under National Solar Mission (NSM) - Amendment regarding.**

Sir,

In continuation to the Administrative Approval for '**Grid Connected Rooftop and Small Solar Power Plants Programme**' under 'Off-Grid and Decentralized Solar Applications' scheme issued vide no. 30/11/2012-13/NSM dated 26<sup>th</sup> May, 2014 and the guidelines for the same issued vide even no. dated 26<sup>th</sup> June, 2014, I am directed to convey the approval of the President of India for scaling-up of the budget outlay of 'Grid Connected Rooftop and Small Solar Power Plants Programme' from Rs.600 crore during the 12<sup>th</sup> Five Year Plan to Rs.5000 crore for implementation over a period of five years i.e. 2015-16, 2016-17, 2017-18, 2018-19 and 2019-20 under National Solar Mission. Out of this Rs.5000 crore, the outlay of Rs.1750 crore will be allocated for implementation during the 12<sup>th</sup> Five Year Plan and balance outlay of Rs.3250 crore will be allocated for implementation during the remaining period i.e. 2017-18 to 2019-20.

2. The pattern of Central Financial Assistance (CFA) of the grid connected solar rooftop systems will be retained as per existing on-going scheme under implementation as issued vide no 30/11/2012-13/NSM dated 26<sup>th</sup> June, 2014, with following modifications:

- i. The existing pattern of capital subsidy at the rate upto 30% of benchmark cost for the general category States (upto 70% of benchmark cost for special category States i.e., North Eastern States including Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Lakshadweep, Andaman & Nicobar Islands) is being modified to the extent that there will be no subsidy for commercial and industrial establishments in the private sector.
- ii. The Government Institutions including Public Sector Undertakings (PSUs) shall not be eligible for subsidy; instead they will be given achievement-linked incentives/awards for which a separate notification will be issued.
- iii. All remaining sectors including residential, institutional (hospitals, educational institutions etc.), social sectors etc. will be eligible for subsidy as above (irrespective of the type of electricity connection).
- iv. The details of sector-wise eligibility of Central Financial Assistance is given in **Annexure**.



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इंडिया एसएमई टेक्नोलॉजी सर्विसेस लिमिटेड  
INDIA SME TECHNOLOGY SERVICES LIMITED

3. The other terms and condition of the existing "Grid Connected Rooftop and Small Solar Power Plants Programme" under implementation vide no. 30/11/2012-13/NSM dated 26<sup>th</sup> May, 2014 and the guidelines vide even no. dated 26<sup>th</sup> June, 2014 will remain same.

4. To ensure smooth and timely implementation of the scheme, MNRE will be authorized to make amendments in the terms and conditions of the scheme including subsidy pattern, within the broad parameters outlined, with the approval of Minister, NRE without increasing the total financial requirement.

5. The financial outlay is being revised from Rs.600 crore to Rs.5000 crore for implementation over a period of 5 years from 2015-16 to 2019-20. The year-wise estimated financial outlay and corresponding targets would be as follows:

(Rs. in Crore)

Sl. No.	Items	2015-16	2016-17	2017-18	2018-19	2019-20	Total
1.	Physical Targets (in MWp) to be sanctioned/awarded*	1000	1500	1500	200	---	4200
2	Capital Subsidy including incentives/awards*	210	1445	1435	940	695	4725
3	Capacity building, Surya Mitra's training, awareness generation, seminars/workshops literature/guidelines, consultancy/Project Management Cell, R&D, innovative projects, monitoring, software/IT tools development, testing facilities etc. as per provisions in the programme.	25	35	35	30	10	135
4	Service charges to the State Nodal Agencies, DISCOMs, Solar Energy Corporation of India, IREDA, REC, NHB, Banks or any other Govt. organizations (upto 3% of total budget/CFA).	15	20	30	30	45	140
<b>Total</b>		<b>250</b>	<b>1500</b>	<b>1500</b>	<b>1000</b>	<b>750</b>	<b>5000</b>

\*Estimates based on present average benchmark cost as Rs.7.5 crore per MWp. This will change from time to time. The above year-wise allocations may be changed within the overall provisions of the scheme as per demand and feasibility.

6. The expenditure involved will be debited to following budget heads for current financial year 2015-16:

Budget Heads
Demand No. 69-Ministry of New and Renewable Energy
Major Head: 2810-New & Renewable Energy
Minor Head: 101-Grid Interactive & Distributed Renewable Power
01-Grid Interactive Renewable Power
04-Solar Power
01.04.31-Grants-in-Aid General during the year 2015-16 (Plan).
01.04.33-Subsidy
01.04.20-Other Administrative Expenses

*AP Pathi*


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7. This is an amendment to the Administrative Approvals issued earlier for implementation of the "Grid Connected Rooftop and Small Solar Power Plants Programme" under "Off-Grid & Decentralized Solar Applications" scheme of National Solar Mission vide order no. 30/11/2012-13/NSM dated 26<sup>th</sup> May, 2014 and the guidelines for the same issued vide even no. dated 26<sup>th</sup> June, 2014.

8. The implementation of above amendments in the programme will come into effect from the date of issue of this amendment.

9. This sanction issues in exercise of powers delegated to this Ministry and with the concurrence of IFD dated 15.02.2016 vide their Dy. No. 2027 dated 11.02.2016.


  
[Dr. Arun K Tripathi]  
Adviser/Scientist 'G'  
Telefax: 011-24363035  
Email: [aktripathi@nic.in](mailto:aktripathi@nic.in)

**Copy for information and appropriate action to:-**

1. All Central Ministries and Departments;
2. Department of Public Enterprises (DPE), Block 14, CGO Complex, New Delhi
3. Principal Director of Audit, Scientific Audit-II, DGACR Building, I.P. Estate, Delhi
4. Principal Secretaries/Secretaries (Energy Departments) all States /UTs
5. All State/UT Nodal Agencies (by name)
6. All Municipal Commissioners
7. CMD, IREDA, 1<sup>st</sup> floor, East Court, Indian Habitat Centre, Lodhi Road, New Delhi
8. Director General, Bureau of Indian Standards, Manak Bhawan, 9, Bahadur Shah Zafar Marg, New Delhi
9. D.G., National Institute of Solar Energy, Gwal Pahari, Gurgaon, Haryana
10. MD, Solar Energy Corporation of India, D-3, A Wing, 1<sup>st</sup> Floor, Religare Building, District Centre, Saket, New Delhi-110017
11. National Housing Bank and all Nationalized/Private Banks.
12. Director, National Institute of Wind Energy/Director, National Institute of Bio Energy

**Copy to:**

1. PS to Hon'ble Minister of State for Power, Coal and New and Renewable Energy, Shram Shakti Bhawan, New Delhi.
2. PSO to Secretary, MNRE
3. PS to JS&FA, MNRE
4. JS(VJ)/JS(TK)
5. All Advisers & Group Heads
6. All Under Secretaries in MNRE
7. Director (NIC) to upload this on the Ministry's website
8. CA, MNRE/Cash Section
9. Hindi section for Hindi version
10. Sanction folder

  
[Dr. Arun K Tripathi]  
Adviser/Scientist 'G'

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## Sector-wise eligibility of Central Financial Assistance (CFA) and Achievement-linked Incentives/Awards

Sl. No.	Category	Coverage of buildings	Central Financial Assistance/Achievement linked Incentives & awards
(i)	<b>Residential</b>	All types of residential buildings	CFA upto 30% of benchmark cost for General Category States/UTs and upto 70% of benchmark cost for Special Category States i.e., North Eastern States including Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Lakshadweep, Andaman & Nicobar Islands.
(ii)	<b>Institutional</b>	Schools, health institutions including medical colleges & hospitals, universities, educational institutions etc. [applicable to not-for-profit registered organizations only, except those covered under Sl. No. (iv), (v) & (vi)].	CFA upto 30% of benchmark cost for General Category States/UTs and upto 70% of benchmark cost for Special Category States i.e., North Eastern States including Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Lakshadweep, Andaman & Nicobar Islands.
(iii)	<b>Social sector</b>	Community centres, welfare homes, old age homes, orphanages, common service centres, common workshops for artisans or craftsman, facilities for use of community, Trusts/NGOs/Voluntary organizations/Training institutions, any other establishments for common public use etc. [applicable to not-for-profit registered organizations only, except those covered under Sl. No. (iv), (v) & (vi)].	CFA upto 30% of benchmark cost for General Category States/UTs and upto 70% of benchmark cost for Special Category States i.e., North Eastern States including Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Lakshadweep, Andaman & Nicobar Islands.
(iv)	<b>Government Buildings</b>	Buildings of Both Central, & State Government, local government covering all Government offices.	No CFA. Achievement linked Incentives/awards will be provided.
(v)	<b>Government Institutions</b>	Government Institutions, Public Sector Undertakings, all buildings owned by Government directly or by any Government owned societies, companies, corporations, Institutions or organizations, Government educational/health institutions.	No CFA. Achievement linked Incentives/awards will be provided.
(vi)	<b>Private, commercial and industrial sector</b>	All types of buildings.	No CFA.

No CFA is applicable for any type of Government buildings, Government institutions/Government organizations including PSUs. Only achievement linked Incentives/awards will be eligible for which a separate notification will be issued.

  
[Dr. Arun K Tripathi]  
Adviser/Scientist 'G'

## Annexure 3: Punjab Government Solar Policy

### Eligibility Criteria

All the consumers of the State Distribution licensee or PSPCL who intend to encourage solar energy and set up solar PV plants at available places on roof-tops of Individual households, industries, Government or Semi-Government or Local Body offices, commercial establishments, institutions, residential complexes shall be eligible with project capacity ranging from minimum 1 KWp upto 1MWp (AC side) with or without battery back-up support. Consumers may generate solar power for self consumption and may feed excess power into the grid to be adjusted as per the Policy.

**Installed Capacity:-** The maximum capacity of the Roof Top Solar PV system, as mentioned on AC side at the output of inverter based on rated inverter capacity, shall not be more than 80% of the Sanctioned Connected Load or Contract Demand (in KVA converted to KW at normative Power Factor of 0.90) of the consumer and the minimum capacity shall not be less than 1 KW. Eligible Consumers shall assess their rooftop solar PV plant capacity based on the shadow less clear roof top area or vacant spaces, SCL or CD, actual annual energy consumption pattern and the capacity of Distribution transformer.

### Procedure for Net Metering

**Net-metering :-** (1) The distribution licensee shall allow non-discriminatory net-metering arrangement on first-cum-first serve basis for both self-owned and third party owned rooftop PV systems as long as the total capacity (in MW) does not exceed the target capacity determined.

- 2 The distribution licensee shall accept the solar PV power for 25 years as per the useful life of the SPV system.

**Capacity Targets for distribution licensee:-** Maximum cumulative capacity to be installed under this Policy shall be decided by GOP on yearly basis. The shortfall in any year shall be carried forward to the next succeeding year provided that the cumulative capacity to be allowed at a particular distribution transformer shall not exceed 30% of the rated capacity of the distribution transformer; on first-cum-first serve. The applications not considered will lapse and consumer will have to apply afresh in the next financial year.

The distribution licensee shall update distribution transformer level capacity available for connecting rooftop solar systems under net metering arrangement on 1<sup>st</sup> October every year and shall provide the information on its website as well as to the Commission and PEDDA.

**Billing Process:-** (1) On commissioning of the solar roof top system and at the end of each of the billing cycle/settlement period, PSPCL shall take energy meter readings for import or drawl and export or injection of power and work out the net energy flow quantum from or to the consumer. In case the net flow is towards the PSPCL i.e. the consumer has injected/exported the net surplus energy to the PSPCL system, such quantum will be treated as energy banked by the consumer with PSPCL in the current billing cycle. In such scenario, the consumer will be issued Energy Account Statement along with the bill for charges like meter rentals, service charges etc., and banked energy will be carried forward for accounting in the next billing cycle. If the net energy flow is from the PSPCL, then the consumer will be issued the Energy Account Statement and Energy Bill for the net power drawn in the billing cycle plus other charges.

(2) The Energy Account Statement to be issued to consumer by PSPCL for each billing cycle shall show the quantum of export/injected energy from roof-top Solar PV System, import/drawl of energy from PSPCL in the billing period, banked energy of the previous billing cycle, net billed energy for payment by the consumer for that billing period or net banked energy carried forward to the next

billing period separately. The Energy Bill for import will be prepared as per the retail supply tariff as approved by the PSERC for the category to which the consumer belongs. The energy exported to PSPCL from the rooftop Solar PV system shall be set-off against the energy imported from the PSPCL grid at the PSERC approved retail supply tariff applicable to the particular consumer category.

- (3) At the end of the next and subsequent billing cycles/end of settlement period, PSPCL will take the energy meter reading and work out the net flow taking into consideration the energy banked in the previous billing cycle if any, along with the readings of import and export of power for current billing cycle and work out the net energy account bill, as the case may be. The procedure will be repeated at the end of every billing cycle. The settlement of net energy including any banked energy shall be done at the end of each settlement period based on 90% of the consumption. At the beginning of each settlement period, cumulative carried over injected energy shall be reset to zero.
- (4) All Rules and regulations including tariff shall be governed by the orders of PSERC and terms and conditions prescribed in Application & Agreement (A&A) form. An additional form or MOU shall be signed between the licensee and seller of such roof-top Solar PV sources and shall include necessary terms and conditions of meter reading, meter-rent, billing, payment, payment security arrangements, rate of delayed payment surcharge etc. and shall become the part of A&A Form.
- (5) All the instructions, rules and regulations applicable to the consumers of the PSPCL for the applicable class/category including but not limited to the Tariff rates, Payment Schedule, Late payment surcharge, connected load/ contract demand, Load Surcharge, peak load restrictions, Advance Consumption Deposit etc., shall also be applicable to the Roof Top Solar plant owner as a consumer of PSPCL. Electricity duty shall be levied as per GOP instructions amended from

time to time and at present ED is applicable on the net power drawn by the Consumer from PSPCL.

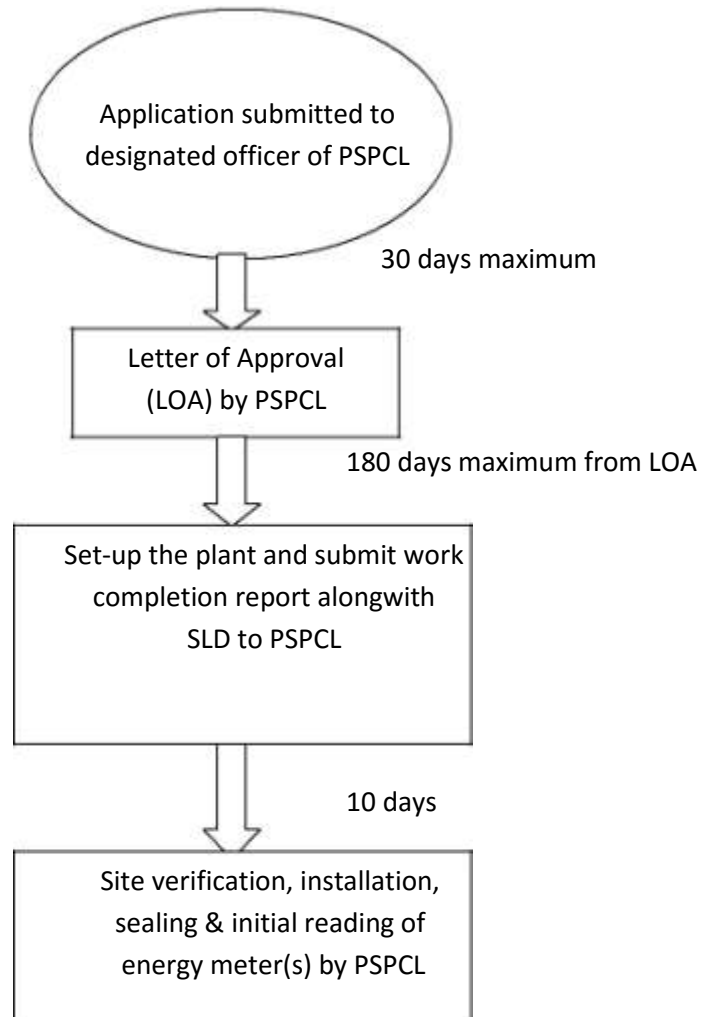
As long as the consumer having set-up the solar power plant consumes power from PSPCL and/or generated from solar plant or banked solar energy up to or more than the MMC level in any billing period, Monthly Minimum Charges (MMC) shall not be leviable.

### **Procedure**

The consumer intending to set up the Roof top PV system can download the solar net-metering rooftop Application-cum-Agreement form from the website of the PSPCL and shall submit the same to designated officer of PSPCL for grant of permission to set-up the plant. After checking the feasibility, the applicant shall be issued Letter of Approval by PSPCL within 30 days of receipt of application. The consumer shall set up the plant and submit the work completion report along with Single Line Diagram of the synchronizing and protection arrangement issued by the plant supplier/EPC contractor that the plant has been installed as per approved standards and specifications within 180 days. After site verification, PSPCL shall install and seal the Bi-directional energy meter(s) within 10 days of the submission of report and plant will be treated as commissioned for net-metering commercial operations from that date. In case of delay the consumer shall have to get further extension from PSPCL. Such extension will be granted for a maximum period of 2-months only and the approval granted will lapse automatically if the project is not set-up even in the extended 2-months period. However, he will be eligible to apply in the next financial year but his application will be kept at the bottom of the list of applicants and he will be permitted to set-up the plant only if all the applicants above him are selected and there is still capacity available for allotment.



## Timelines to set-up Grid Interactive Roof-Top Solar Photovoltaic Power Plants



**Application Fee :-** The applicant shall pay application fee of Rs. 50/KVA alongwith the application to PSPCL. No parallel operation charges shall be leviable on these projects as per NRSE Policy 2012.

## Annexure 4: Data of Site Visit

### Aadi Knit Fab

#### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	Aadi Knit Fab Near Jalandhar Bypass Road, Kali Sarak, Govindpura, Ludhiana
2	Year of Operation	2006
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Ved Prakash Gupta Unit Head +91 – 9872249492
4	MSME category	Medium
5	No of hours operation/shift	12
6	No of shifts/ day	2
7	No of days/year operation	360
8	Name of Finished Product	Ready Made Garment

#### 2. Production Details

Sl. No.	Particulars	Details
1	Finished Products	Annual Production in MT
1.1	Ready Made Garment	100-150 MT

#### 3. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	500
2	Maximum demand (kVA)	278



3	Avg. Electricity bills (Rs/month)	Rs. 5.93 Lakh / Month
4	Annual energy consumption	979489 kVAh
5	Average Electricity Rate	Rs. 7.30 / unit
6	Transformer Capacity (kVA)	1000 kVA
7	Voltage (V)	11 KV
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	12 Months Electricity Bills <input checked="" type="checkbox"/> 12 Months Fuel bill <input type="checkbox"/>

#### 4.1 Thermal Load Details (HSD/ LDO /RFO/LSHS/Pet Coke-FIRED UNIT Details)

Equipment	Nos.	Capacity	Fuel Type
Steam boilers	1	1.5 TPH	Wood

#### 4. Other Details

Sl. NO.	Particulars	Details	
1	Latitude (Degree) / Longitude (Degree)	30.93985 °C / 75.854 °C	
2	No. of Buildings	2	
3	Name of the Building	Building 1	Building 2
4	Age of Buildings	11	11
5	Approx Roof area available (m <sup>2</sup> )	71 m <sup>2</sup>	360 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	55 m <sup>2</sup>	280 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal	Horizontal

9	Usable Land Area (in acres), in case available	-
10	Potential of Solar Power	34 kWp
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

\* If more buildings are available please add more columns.

### 5. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of each Equipment	Daily Operating Hours	Remarks
1	Elgi Compressor	2	10 HP		
2	Press	10-11	150 W		
3	Stitching M/c	100	200-250 W		
4	Cutter M/c	7	100 – 150 W		
5	Tubetex	2	7 kW		
6	Platting M/c	1	5 HP		
7	Embroidery M/c	3	1.5 kW		
8	Tumbler M/c	5			
9	Dryer M/c	5			
10	Soft Winding M/c	2			
11	Winch M/c	3			
12	Tubular M/c	3			
13	Raging M/c	2			
14	Hydro Extractor	2			
15	ID Fan				
16	FD Fan				



## AMIT Enterprises

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	<b>Amit Enterprises</b> Anandpuri Colony, Kali Sarak, Govindpura, Ludhiana
2	Year of Operation	1980
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Anil Gupta Unit Head +91 – 9872249493
4	MSME category	Small
5	No of hours operation/shift	12
6	No of shifts/ day	2
7	No of days/year operation	360
8	Name of Finished Product	Knitted Fabrics

### 2. Production Details

Sl. No.	Particulars	Details
1	Finished Products	Annual Production in MT
1.1	Knitted Fabric	125 – 150 MT / Month

### 3. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	680
2	Maximum demand (kVA)	142
3	Avg. Electricity bills (Rs/month)	Rs. 5.30 Lakh / Month



4	Annual energy consumption	861247 kVAh
5	Average Electricity Rate	Rs. 7.5 / unit
6	Transformer Capacity (kVA)	700 kVA
7	Voltage (V)	11 kV
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	12 Months Electricity Bills <input checked="" type="checkbox"/> 12 Months Fuel bill <input type="checkbox"/>

### 3.1 Diesel Generating Set

Sl. No.	Make	Capacity of DG Set (kVA)	Average Monthly Running Hours	Average Monthly Diesel Consumption (kL)
1	Caterpillar	250	-	-
2	Bhaskar	300		

### 4. Other Details

Sl. NO.	Particulars	Details	
1	Latitude (Degree) / Longitude (Degree)	30.94 °C / 75.85 °C	
2	No. of Buildings	1	
3	Name of the Building	Building 1	Building 2
4	Age of Buildings	30	25
5	Approx Roof area available (m <sup>2</sup> )	100 m <sup>2</sup>	490 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	81 m <sup>2</sup>	400 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC	RCC

8	Uniformity of Roof (horizontal/slant)	Horizontal	Horizontal
9	Usable Land Area (in acres), in case available	-	-
10	Potential of Solar Power	48	
11	Photographs of the building roof (E,W,N & S sides)	Yes	
12	Remarks		

\* If more buildings are available please add more columns.

#### 5. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Knitting M/c	50	5 HP/7.5HP	12	
2	Air Compressor	2	30	12	



## KUDU KNIT PROCESS PVT LTD

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	M/s Kudu Knit Process Pvt. Ltd. Factory: Plot No. C – 219, Phase – 8, Focal Point, Ludhiana
2	Year of Operation	1999
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Varun Mittal Director 0161 – 2672934
4	MSME category	Medium
5	No of hours operation/shift	8
6	No of shifts/ day	3
7	No of days/year operation	300
8	Name of Finished Product	Knitted Fabrics, Sports Wear

### 2. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	1495
2	Maximum demand (kVA)	
3	Avg. Electricity bills (Rs/month)	Rs. 19.90 Lakh / Month
4	Annual energy consumption	31,73,200 kVAh
5	Average Electricity Rate	Rs. 7.5 / unit
7	Voltage (V)	11 kV
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No Yes





### 3.1 Diesel Generating Set

Sl. No.	Make	Capacity of DG Set (kVA)	Average Monthly Running Hours	Average Monthly Diesel Consumption (kL)
1	Sudheer	380	-	48,200 Litre
2	Sudheer	600		

Equipment	Nos.	Capacity	Fuel Type
Steam boilers	1	5TPH	
Thermopac's	1	15 Lac kCal/hr	

### 3. Other Details

Sl. NO.	Particulars	Details	
1	Latitude (Degree) / Longitude (Degree)	30.95 °C / 75.86 °C	
2	No. of Buildings	2	
3	Name of the Building	Building 1	Building 2
4	Age of Buildings	18	18
5	Approx Roof area available (m <sup>2</sup> )	1460	750
6	Un-shaded Roof Area (m <sup>2</sup> )	730	600
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal	Horizontal
9	Usable Land Area (in acres), in case available	-	-
10	Potential of Solar Power	73 kWp	60 kWp
11	Photographs of the building roof (E,W,N & S sides)	Yes	
12	Remarks		

\* If more buildings are available please add more columns.

#### 4. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Boiler ID Fan	1	30	24	
2	Boiler FD Fan	1	22.5	24	
3	Boiler Feed Water Pump	1	3.75	24	
4	Themo pack – ID Fan	1	18.75	24	
5	Themo pack – FD Fan	1	9.4	24	
6	Thermic Fluid Pump	1	15	24	
7	Air Compressor # 1	1	192 CFM		
8	Air Compressor # 2	1	126 CFM		
9	Fabric Dyeing Long Tube M/c	5	250 kg – 400 kg		
10	Fabric Dyeing Soft Flow M/c	10	50 – 1000 kg		
11	Cone Dyeing M/c		50 – 1000 kg		
12	Relax Dryer		3 kW		
13	Printing M/c				
14	Stenter M/c		15 kW		
15	Slatter M/c				
16	Winding M/c	4			
17	Hydraulic Raising M/c				
18	ETP				
19	DM Plant				
20	Knitting M/c		3.75 kW		
21	Sewing M/c		150 W		

## Ludhiana Knit Tech Pvt Ltd

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	Ludhiana Knit Tech Pvt Ltd Jandiali, Kohara, Ludhiana
2	Year of Operation	1998
3	Name of Unit Head Designation Mobile No. & Landline No.	Mr. Satish Nagpal Unit Head +91 – 98880 22292
4	MSME category	Small
5	No of hours operation/shift	8
6	No of shifts/ day	3
7	No of days/year operation	350
8	Name of Finished Product	Kitted Textile

### 2. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	490
2	Maximum demand (kVA)	163
3	Avg. Electricity bills (Rs/month)	Rs. 14.5 Lakh / Month
4	Annual energy consumption	2469744 kVAh
5	Average Electricity Rate	Rs. 7.03 / unit
6	Transformer Capacity (kVA)	500 kVA
7	Voltage (V)	415 V
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No
10	Documents Required	Copy of Electricity Bills 12 Months Fuel bill



### 3. Other Details

Sl. NO.	Particulars	Details
1	Latitude (Degree) / Longitude (Degree)	30.95 °C / 75.86 °C
2	No. of Buildings	1
3	Name of the Building	Building 1
4	Age of Buildings	20
5	Approx Roof area available (m <sup>2</sup> )	700 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	700 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	Tin Shed
8	Uniformity of Roof (horizontal/slant)	Slant
9	Usable Land Area (in acres), in case available	
10	Potential of Solar Power	70
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

### 4. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Tubular M/c	5	37.5 kW		
2	Knitting M/c	23	13		
3	Raging M/c	1	13		
4	Plating M/c	1	0.75		
5	Reversing M/c	2	6.34		
6	Collar M/c	5	0.5		
7	Screw Compressor	2	21		
8	Reciprocating Compressor	2	7.5		
9	Submersible Pump	1	3.73		



## Nivea Knitting Works

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	Nivea Knitting Works Factory: St No.1, Veer Nagar, Bahadur Ke Road, Ludhiana
2	Year of Operation	2009
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	+91 – 8872012982
4	MSME category	Small
5	No of hours operation/shift	12
6	No of shifts/ day	1
7	No of days/year operation	360
8	Name of Finished Product	Jackets, T – shirts, Sweat Shirt

### 2. Production Details

Sl. No.	Particulars	Details
1	Finished Products	Annual Production in MT
1.1	Ready Made Garment	50-60 MT



### 3. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	99.81
2	Maximum demand (kVA)	26.8
3	Avg. Electricity bills (Rs/month)	Rs. 54,470 / Month
4	Annual energy consumption	99,038 kVAh
5	Average Electricity Rate	Rs. 6.6 / unit
6	Transformer Capacity (kVA)	500 kVA
7	Voltage (V)	415 V
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	12 Months Electricity Bills <input checked="" type="checkbox"/> 12 Months Fuel bill <input type="checkbox"/>

#### 3.1 Diesel Generating Set

Sl. No.	Make	Capacity of DG Set (kVA)	Average Monthly Running Hours	Average Monthly Diesel Consumption (kL)
1	Sudheer	150	-	-



#### 4. Other Details

Sl. NO.	Particulars	Details
1	Latitude (Degree) / Longitude (Degree)	30.948368 °C / 75.847883 °C
2	No. of Buildings	1
3	Name of the Building	Building 1
4	Age of Buildings	8
5	Approx Roof area available (m <sup>2</sup> )	800 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	620 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal
9	Usable Land Area (in acres), in case available	-
10	Potential of Solar Power	62 kWp
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

\* If more buildings are available please add more columns.

#### 5. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Stitching M/c	50	200 W	12	
2	Knitting M/c	15	5 HP	12	
3	Press M/c	50	150 W	12	



## Singla Knit Wear

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	Singla Knit Wear 59, Inder Prastha Nagar, Behind Ram Sharnam Pull, Haibowal Kalan
2	Year of Operation	2001
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Sanjiv Singla Jain Unit Head +91 – 98880 24460
4	MSME category	Small
5	No of hours operation/shift	12
6	No of shifts/ day	1
7	No of days/year operation	360
8	Name of Finished Product	Ready Made Garments

### 2. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	106.86
2	Maximum demand (kVA)	40.5
3	Avg. Electricity bills (Rs/month)	Rs. 85,634 / Month
4	Annual energy consumption	155693 kVAh
5	Average Electricity Rate	Rs. 6.6 / unit
6	Transformer Capacity (kVA)	500 kVA
7	Voltage (V)	415 V
8	Power Cut Details (in daily hours)	-





9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	Copy of Electricity Bills <input checked="" type="checkbox"/> 12 Months Fuel bill <input type="checkbox"/>

### 3. Other Details

Sl. NO.	Particulars	Details
1	Latitude (Degree) / Longitude (Degree)	30.94 °C / 75.87 °C
2	No. of Buildings	1
3	Name of the Building	Building 1
4	Age of Buildings	16
5	Approx Roof area available (m <sup>2</sup> )	750 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	600 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal
9	Usable Land Area (in acres), in case available	
10	Potential of Solar Power	60
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

\* If more buildings are available please add more columns.

### 4. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Stitching M/c	35	200 W	12	
2	Knitting M/c	15	5HP/ 7.5 HP	12	



## S.J. Fabrics

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	S.J. Fabrics Near 1008/20, Street No. 10, Basti Jodhewal , Bal Singh Nagar, Ludhiana
2	Year of Operation	2001
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Ativ Jain Unit Head +91 – 9815902200
4	MSME category	Small
5	No of hours operation/shift	12
6	No of shifts/ day	2
7	No of days/year operation	360
8	Name of Finished Product	Knitted Fabrics

### 2. Production Details

Sl. No.	Particulars	Details
1	Finished Products	Annual Production in MT
1.1	Knitted Fabrics	125 – 150 MT / Month

### 3. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	88.86
2	Maximum demand (kVA)	57
3	Avg. Electricity bills (Rs/month)	Rs. 1.05 Lakh / Month
4	Annual energy consumption	191236 kVAh
5	Average Electricity Rate	Rs. 6.6 / unit
6	Transformer Capacity (kVA)	500 kVA
7	Voltage (V)	415 V
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	Copy of Electricity Bills 12 Months Fuel bill

√

#### 3.1 Diesel Generating Set

Sl. No.	Make	Capacity of DG Set (kVA)	Average Monthly Running Hours	Average Monthly Diesel Consumption (kL)
1	Sudheer	150	-	-



#### 4. Other Details

Sl. NO.	Particulars	Details
1	Latitude (Degree) / Longitude (Degree)	30.932 °C / 75.86656 °C
2	No. of Buildings	1
3	Name of the Building	Building 1
4	Age of Buildings	15
5	Approx Roof area available (m <sup>2</sup> )	250 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	200 m <sup>2</sup>
7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal
9	Usable Land Area (in acres), in case available	
10	Potential of Solar Power	20
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

\* If more buildings are available please add more columns.

#### 5. List of Equipments

Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Stitching M/c	35	200 W	12	
2	Air Compressor	1	15	12	
3	Press M/c	2	150 W		
4	Knitting M/c	13	5HP/ 7.5 HP		
5	Servo	1			
6	Collar M/c	2	250		



## Sungrace Fabrics

### 1. General Information

Sl. No.	Particulars	Details
1	Name & Address of Company	Sungrace Fabrics Near Jalandhar Bypass Road, Kali Sarak, Govindpura, Ludhiana
2	Year of Operation	1994
3	Name of Unit Head Designation Mobile No. & Landline No. Email:	Mr. Vipin Jain Unit Head +91 – 9814009070
4	MSME category	Small
5	No of hours operation/shift	12
6	No of shifts/ day	2
7	No of days/year operation	360
8	Name of Finished Product	Knitted Fabrics

### 2. Production Details

Sl. No.	Particulars	Details
1	Finished Products	Annual Production in MT
1.1	Knitted Fabric	100 MT / Month



### 3. Energy Consumption details

Sl. No.	Particulars	Details
1	Contract demand (kVA)	99.6
2	Maximum demand (kVA)	57.6
3	Avg. Electricity bills (Rs/month)	Rs. 1.44 Lakh / Month
4	Annual energy consumption	261575 kVAh
5	Average Electricity Rate	Rs. 6.6 / unit
6	Transformer Capacity (kVA)	500 kVA
7	Voltage (V)	415 V
8	Power Cut Details (in daily hours)	-
9	Presently any Solar intervention or planning for it	Yes / No No If Yes, Please mention
10	Documents Required	12 Months Electricity Bills <input checked="" type="checkbox"/> 12 Months Fuel bill <input type="checkbox"/>

### 4. Other Details

Sl. NO.	Particulars	Details
1	Latitude (Degree) / Longitude (Degree)	30.94 °C / 75.85 °C
2	No. of Buildings	1
3	Name of the Building	Building 1
4	Age of Buildings	20
5	Approx Roof area available (m <sup>2</sup> )	335 m <sup>2</sup>
6	Un-shaded Roof Area (m <sup>2</sup> )	250 m <sup>2</sup>

7	Type of roof (RCC with parapet/ without parapet/ tin/ asbestos/ any other material)	RCC
8	Uniformity of Roof (horizontal/slant)	Horizontal
9	Usable Land Area (in acres), in case available	
10	Potential of Solar Power	25
11	Photographs of the building roof (E,W,N & S sides)	Yes
12	Remarks	

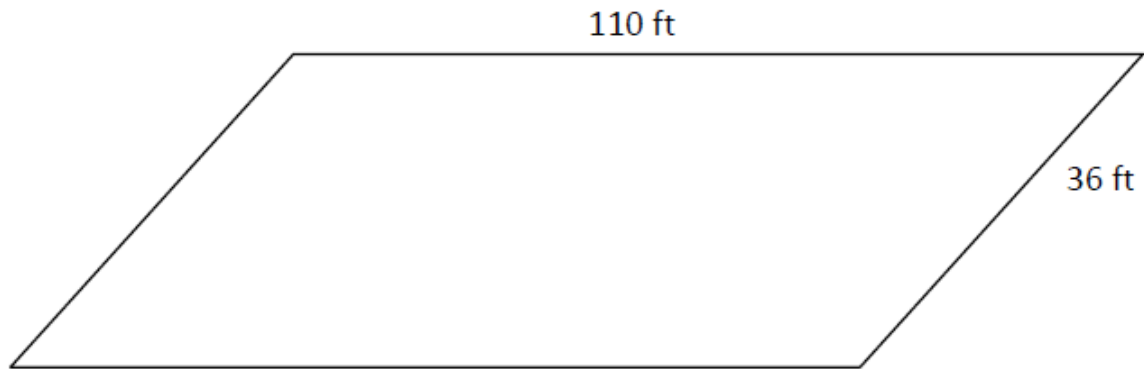
\* If more buildings are available please add more columns.

#### 5. List of Equipments

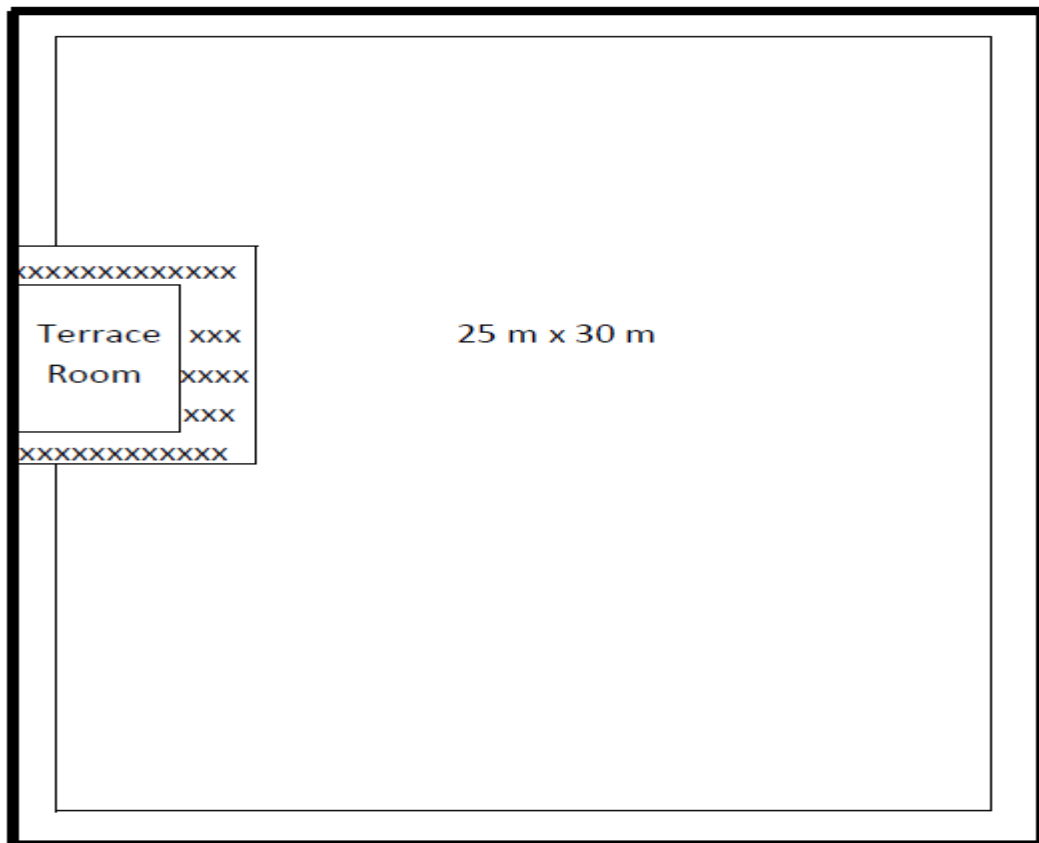
Sl. No.	Equipment Details	No. of Equipment	Capacity of Equipment kW	Daily Operating Hours	Remarks
1	Knitting M/c	14 – 15	5 HP/7.5HP	12	
2	Air Compressor	1	20 HP	12	
3	Standby Compressor	2	10 HP	12	



**Annexure 5: Schematic Representation of Unit's Terrace**

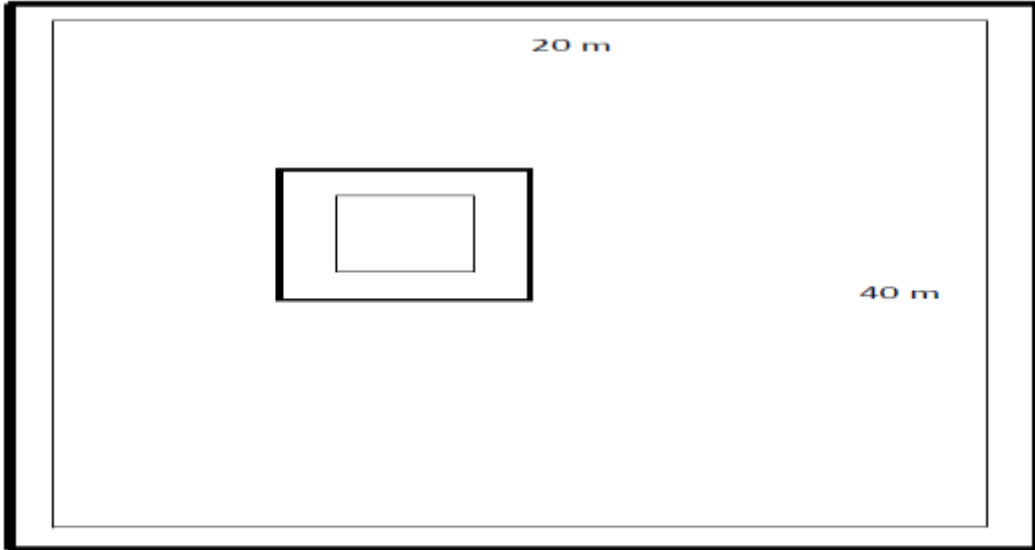


(Schematic Layout of Ludhiana Knit Tech)

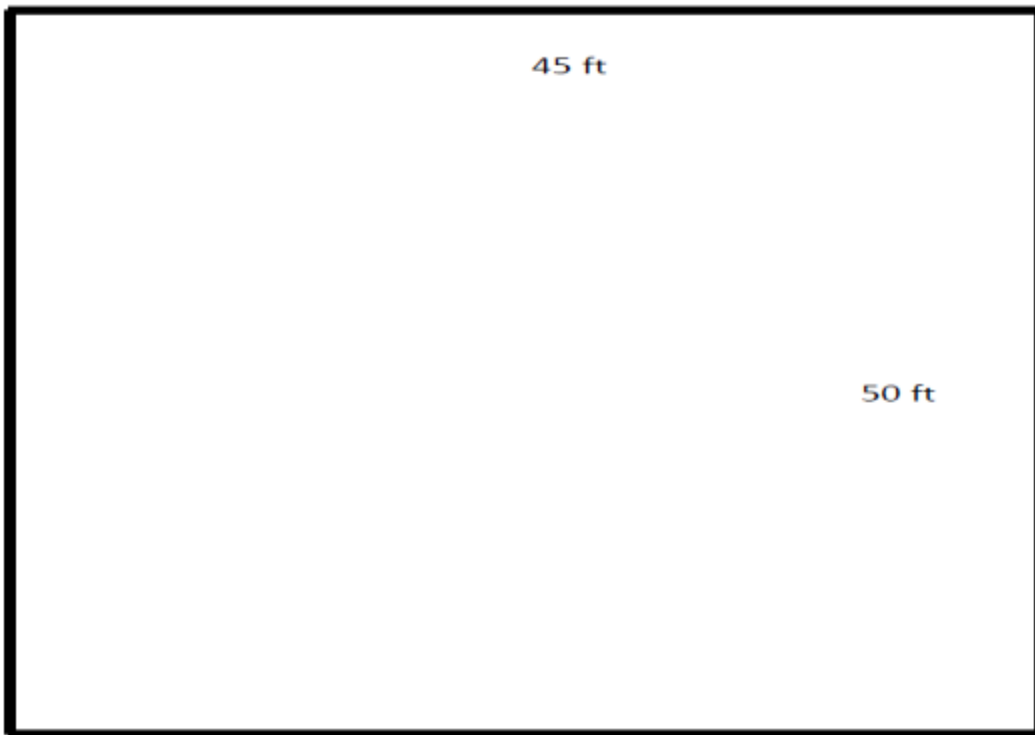


(Schematic Layout of Singla Knit Works)





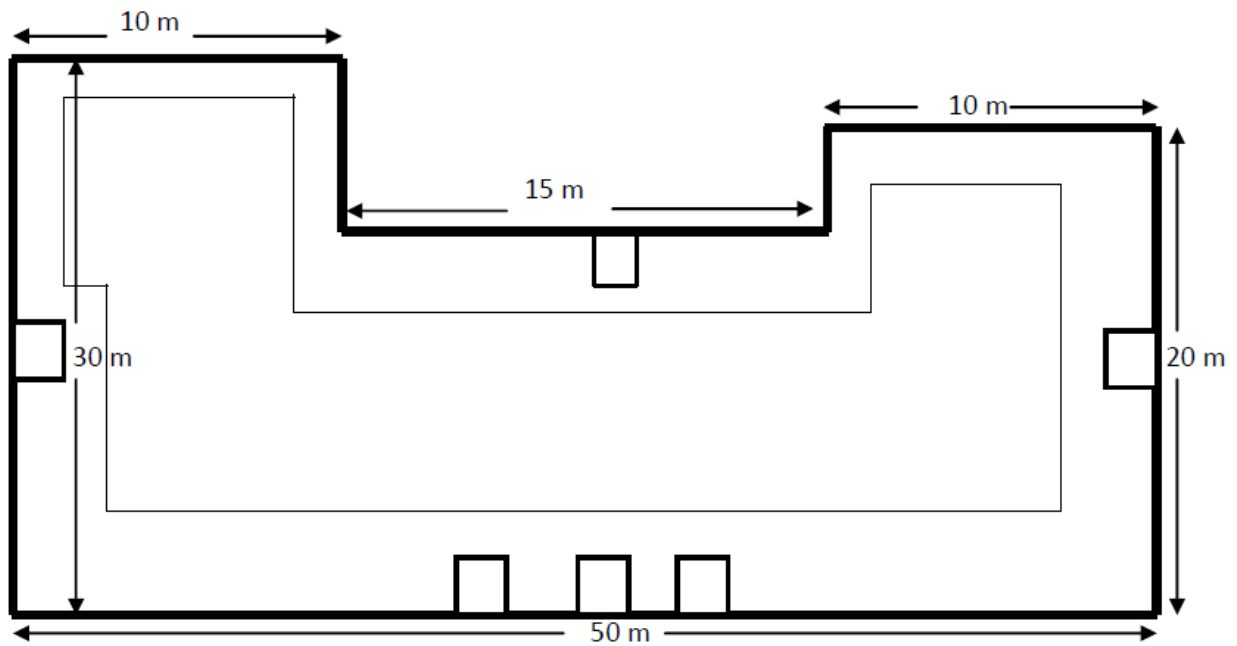
(Schematic Layout of Nivea Knit Tech)



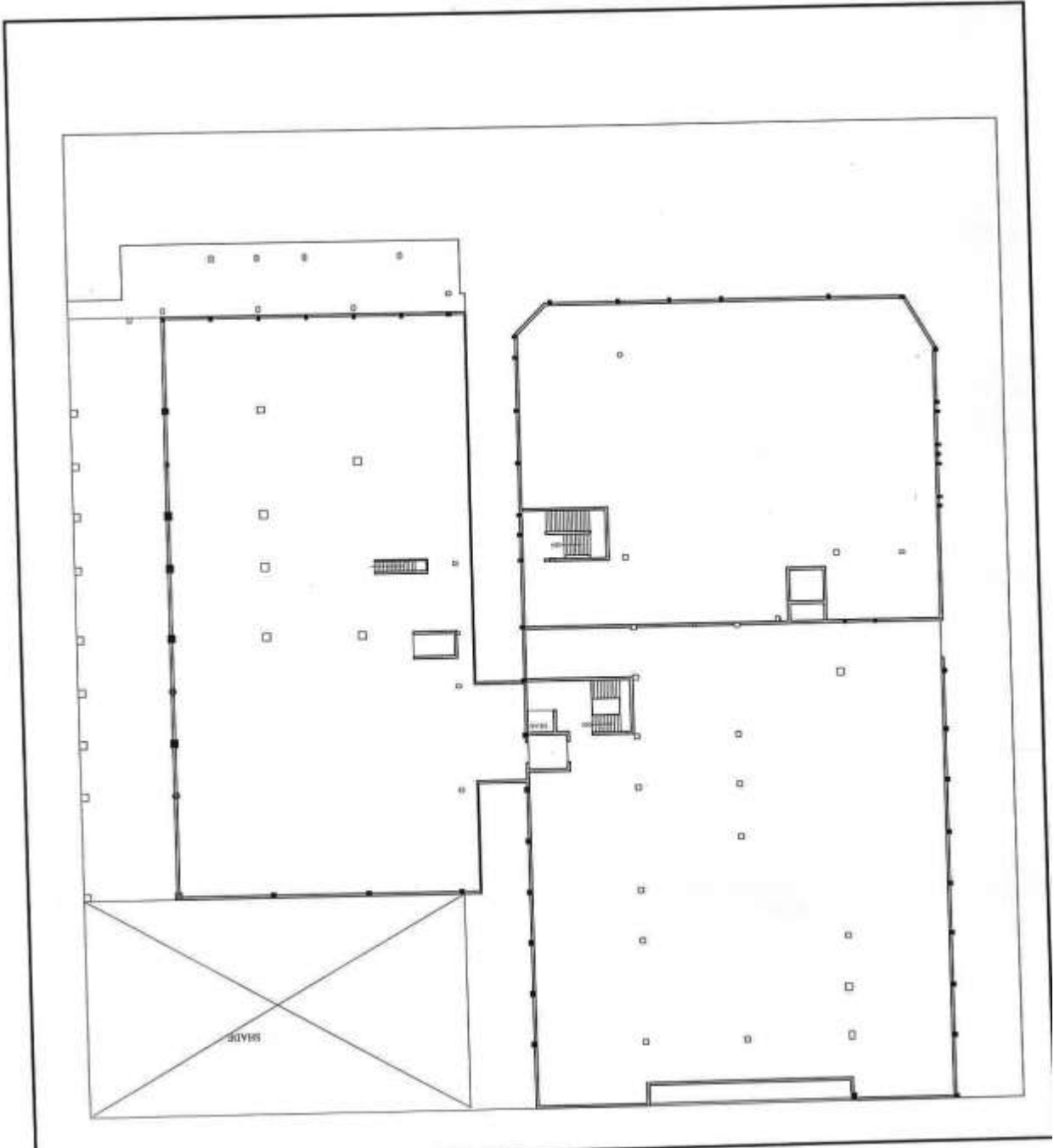
(Schematic Layout of S.J. Fabric)



(Schematic Layout of Sungrace Fabrics)



(Schematic Layout of Amit Enterprises)



(Schematic Layout of Kudu Knit Process Pvt. Ltd.)

### Annexure 6: List of Probable Suppliers

Sl. No.	Name & Address of the Company	Name of the Contact Person & Mobile no.	Parties/Companies/System Integrators approved for capacity utilization
1	<b>8 Minutes Future Energy Pvt. Ltd.</b> Regd. Office-4073, Joy Appt, Sector-2, Dwarka, New Delhi	Daman Kochhar, VP Business Development 09878426198	1 to 500 KW
2	<b>Aanchal Solar System</b> Sethi Complex Third Floor, Shop No. 1, Hall Bazar, Amritsar	Surinder Kumar 9888314056 9914545785	1 to 50 KW
3	<b>Andy Solar Pvt. Ltd.</b> Plot No-245, Industrial Area, Phase-2, Panchkula	Satwant Singh 08283825779	1 to 500 KW
4	<b>BNK Energy Alternatives</b> 307, Sakarpur Surya Complex, 21 Veer Savorkar Block, Shakarpur, Delhi – 92	Shailesh Rajgariah 9810924267	1 to 500 KW
5	<b>Bright Life Solutions</b> Lady of Fatima School Road 22 No. Phatak Patiala -147001	Shailesh Jindel, Director 09878822280	1 to 500 KW
6	<b>C &amp; S Electric Ltd.</b> Okhla Industrial Estate, Phase - III, New Delhi – 110020	Sandeep Kakkar 8826363083	1 to 500 KW



Sl. No.	Name & Address of the Company	Name of the Contact Person & Mobile no.	Parties/Companies/System Integrators approved for capacity utilization
7	<b>CLS Industries</b> 77, 1 <sup>st</sup> Floor, DSIDC Sheds, Okhla Industrial Area, Phase-1, New Delhi	P Rajasekharan 09810343050	1 to 500 KW
8	<b>Eco World Solar</b> Near Moti Mahal Grand Hotel, Saili Road, Pathankot-145001	Rahul Bhandari 9653303399	1 to 100 KW
9	<b>Ganpati Enterprises</b> 16, Bohri Mandir, Jalandhar Road Batala- 143505	Ashok Garg, G.M. 9914211188	1 to 500 KW
10	<b>Inter Solar Systems Pvt. Ltd.</b> Regd. Office-901-A, Industrial Area, Phase-II, Chandigarh	Bhupinder Kumar, Director 09814104139	1 to 50 KW
11	<b>Jiwan Engineers &amp; Consultants</b> 73A,SAS Nagar Jalandhar City, Punjab	Er. Kamaljit Singh Gill 0181-2274140 9646678601	1 to 50 KW
12	<b>LUBI Electronics</b> Sardar Patel Ring Road, Near Bright School, Nana Chiloda, Dist - Gandhi Nagar, Gujarat-382325	Ankit Sharma 083086910881	1 to 500 KW



Sl. No.	Name & Address of the Company	Name of the Contact Person & Mobile no.	Parties/Companies/System Integrators approved for capacity utilization
13	<b>Mittal Machines (P) Ltd.</b> Corporate Office-108/3 Chandra Nagar, Dehradun-248001	Apoorva Mittal, Director 07060855333	1 to 500 KW
14	<b>Multi Overseas India Pvt. Ltd.</b> Plot No. 482-483, Industrial Area Phase-1, Panchkula-134113 (Haryana)	Kishori Lal- Manager Commercial 09855188949	1 to 500 KW
15	<b>Odema Renewables India Pvt. Ltd.</b> 8/7 LG WEA, Karol Bagh, New Delhi-110005	011-45058676	1 to 100 KW
16	<b>PES Engineers Private Limited</b> Regd Office: C/o-Darshan Singh, Opp Kewal Bijliwala Street No-1, Mallan Colony, Gidderbaha, Mukatsar Sahib	Yogesh Sehgal, Director 09810116532	1 to 500 KW
17	<b>Premier Solar Systems Pvt. Ltd.</b> Survey No-54/Part, Above G PullaReddy Sweet House, Vikrampur Colony, Secundarabad	Surinder Pal Singh, Chairman 040-2744415-16 09391036828	1 to 500 KW



<b>Sl. No.</b>	<b>Name &amp; Address of the Company</b>	<b>Name of the Contact Person &amp; Mobile no.</b>	<b>Parties/Companies/System Integrators approved for capacity utilization</b>
18	<b>Punjab Communications Ltd.</b> B-91, Phase 8, Industrial Area, SAS Nagar (Mohali) – 160071	Mohan Lal Nota Manager (Marketing) 09872784466	1 to 50 KW
19	<b>Renew Solar Energy Pvt. Ltd.</b> 10 <sup>th</sup> Floor, DLF Square, Jacaranda Marg, Sec-25 Phase-II, Gurgaon Haryana-122002	Anjit Kumar Manager - Business Development 09910267679	1 to 500 KW
20	<b>Shimato Enterprises Pvt Ltd</b> No-371, SIDCO, Industrial Estate (Opp Godrej Gate No-2) North Phase Ambattur, Chennai-600098	Ranjeet Singh 07891379465	1 to 100 KW
21	<b>Solar First Energy Pvt. Ltd.</b> SCF-6, Phase-1 Market Urban Estate, Jalandhar, Punjab	Gulshan Raj Kakkar 09814810025	1 to 100 KW
22	<b>Su Solartech Systems (P) Ltd.</b> SCO 184, Sector -7C, Chandigarh-160019	HarinderJain 9876542600 9878090103	1 to 100 KW



<b>Sl. No.</b>	<b>Name &amp; Address of the Company</b>	<b>Name of the Contact Person &amp; Mobile no.</b>	<b>Parties/Companies/System Integrators approved for capacity utilization</b>
23	<b>Sunglobe Energy Pvt Ltd</b> SCF-8, 25 Acre Scheme, Barnala Punjab-148101	Yadvinder Singh, Director 09814425901	1 to 50 KW
24	<b>TATA Power Solar Systems</b> Shatabdi Bhavan, 3 <sup>rd</sup> Floor B-12 & 13, Sector 4 Noida UP-201301	Nivedatta Bhattacharya 09990822004	1 to 500 KW
25	<b>Tritronics (India) Pvt Ltd</b> 35B, M.S. Enclave Behind Shani Dev Mandir Dhakoli, Zirakpur Mohali (Punjab)	Mr. Pawan Sahani (Area Manager) 9878894793	1 to 50 KW
26	<b>Ujaas Energy Limited</b> 701, NRK Business Park, Vijay Nagar Square, Indore-452010	0731-4715300 2721672	1 to 500 KW
27	<b>E Sharp Solar Solutions Pvt Ltd</b> Partap Ganj Delhi	Naresh Goyal 9313104202	1 to 500 KW





## References

1. Cluster details – TCI Global Practitioners network for competitiveness, clusters and innovation :<http://www.tci-network.org/initiatives/initiative/3916>
2. NASA Website - [https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?&num=256121&lat=30.95&submit=Submit&hgt=100&veg=17&sit elev=&email=skip@larc.nasa.gov&p=grid\\_id&step=2&lon=75.85](https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?&num=256121&lat=30.95&submit=Submit&hgt=100&veg=17&sit elev=&email=skip@larc.nasa.gov&p=grid_id&step=2&lon=75.85)
3. Govt. Solar Policy - <http://www.mnre.gov.in/solar-mission/jnnsnm/introduction-2/>
4. Punjab State Govt. Policy - <http://peda.gov.in/main/>
5. List of Probable Suppliers - <http://solarpunjab.com/equipment.html>

