EURJA ENERGY GENERATION PRIVATE LIMITED

DETAILED PROJECT REPORT

FINANCING FOR 5MW GRID CONNECTED ROOF TOP SOLAR PV PROJECT ON MULTIPLE GOVERNMENT BUILDING IN MAHARASHTRA IN RESCO MODE

EU/INV/01/22 , R1

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Glossary

GCRT	: Grid connected Roof Top
RESCO	: Renewable Energy Service Company
OPEX	: Operational Expenditure
CAPEX	: Capital Expenditure
CFA	: Central Financial Assistance
PV	: Photo Voltaic
MEDA	: Maharashtra Energy Development Agency
MNRE	: Ministry of New & Renewable Energy
MWp	: Mega Watt peak
Developer	: Eurja OR & Investors
Utility	: Electricity Proving company such as Adani, MSEB,BEST , Tata
SPV	: Special Purpose Vehicle
Net Meter	: Bidirectional Meter measuring Import & Export of Energy
EPC	: Engineering Procurement & Commissioning
O&M	: Operation & Maintenance
Agreement	: Shareholder agreement of SPV
EI	: Eurja Infrastructure
EEGPL	: Eurja Energy Generation Private Limited

BACKGROUND

Government of Maharashtra has envisaged adoption of Solar Energy as a part of its effort to enhance energy security and mitigate climate changes. The state renewable energy policy also emphasis to encourage solar roof top project.

To support state level implementation Govt. of India has also initiated the no. of scheme including "Achievement Linked Incentive Scheme for Installation of 10 MWp Grid Connected Roof Top Solar PV Systems on Government buildings in RESCO mode at various locations in the State of Maharashtra.

Ministry of New & Renewable Energy (MNRE) (Central Govt.) is the APEX body & has appointed Maharashtra energy Development Agency (MEDA) (State Govt.) as a state nodal agency for implementation of its scheme with (Subsidy) Central Finance Assistance (CFA) (incentives).

The Government Departments can set up rooftop solar PV projects under RESCO mode (>10kW to 500kW) from the MEDA empanelled Solar Project Developers ,so as to be eligible for the available incentives (Subsidy) (CFA) under "Achievement Linked Incentive Scheme" as mentioned above.

MEDA has empanelled Solar Project Developers (with allotment region wise to each developer) for implementation of 10 MWp Grid Connected Roof Top Solar PV Systems on Government buildings in RESCO / CAPEX mode at various locations in the State of Maharashtra under "Achievement Linked Incentive Scheme" as mentioned above.

It is proposed to install GCRT Solar PV power plant on Government Building in Maharashtra under the scheme mentioned above. The benefit of Solar PV Power Plant are

Savings on energy bill consumption. (More than 50%)	*Modular & Scalable*
Minimum effect from increasing Electricity Cost.	*Value creation for Roof*
Reduction in CO_2	*Green Building Certification*
Fast depletion fuels	*Other source - Net Metering*
Solar PV has life of 25 Years – long term approach	*Minimum maintenance*

MEDA has appointed M/s Eurja Infrastructure (EI) as a Project developer for Mumbai region for solar power plant establishment under above scheme.

Maharashtra Energy Development Agency (MEDA)

MEDA is working as a State Nodal Agency in renewable energy sector and as a state designated agency in energy conservation sector. MEDA provides Assistance to state and central govt to promote and develop new and renewable sources of energy and technologies and to promote and implement energy conservation.

MNRE though it's Notification No. F. No. 318/53/2018-GCRT dated 07th Feb 2019 regarding allocated MEDA 10.0MW capacity for installation of grid connected rooftop solar power plants under "Achievement Linked Incentive Scheme for Government Sector ". (Refer Schedule 2)

In line with above Notification MEDA invited Expression of Interest (EOI) for empanelment of Bidders for implementation of 10 MW GCRT SPV vide EOI No.: Solar / GCRT-Govt Building/EOI/2018-19 , dated 08th March 2019 under RESCO mode on government buildings in state of Maharashtra. (Refer schedule 3)

MEDA has appointed M/s Eurja Infrastructure (EI) as Project developers for Mumbai region for solar power plant establishment for above scheme vide work order no. REN/ Govt. Build / Resco work order/CR-1/Solar/2019-20/2206 dated 2nd July 2019. (Refer Schedule 4). Eurja proposes to install 5 MW GCRT SPV as a developer on various government building and sell power with tariff of INR 2.74 -/- per unit for 25 years.

ABOUT THE PROMOTERS

ABOUT US

Eurja Infrastructure is a company based in Mumbai. We are system integrators of various solar systems. We carry out Designing, Engineering, Supply, Installation, Testing & Commissioning. We are Empanelled Channel Partner of MEDA. We specialize in Off Grid & On Grid connected system. We ensure reliability, risk free yields & durability by using quality multi system products complementing each other. We don't consider Solar PV system as a product rather we treat it as a service that's required in making sure that the client gets the maximum out of the money they invested. We use components which are BIS & IEC certified. Eurja Infrastructure is driving India's development through clean & low cost energy systems.

PROMOTORS

Prashant Tiwari - Founder

Prashant Tiwari is Founder of Eurja Infrastructure with more than decade experience in establishing Distributed Power Generation through Solar Photo Voltaic (SPV), Extra High Voltage (EHV) Gas Insulated Substations (GIS) & Air Insulated Substation (AIS), Electrical systems of Thermal power plants & balance of plant (BOP) for several industries with customer oriented mind-set and ability to implement new opportunities with innovation in a highly competitive market.He has also worked at Vikram Solar, Vema Solar, Reliance Infrastructure Mumbai Transmission Business , EMCO , Sandwell India , Desien Pvt Ltd. He has also published several papers at EQ, CIGRE India, CBIP, Electrical India Magazine & other technical forums.His Area of expertise are

- Strategic Planning & Business Expansion
- Engineering & Design , Construction , Operation & Maintenance (O&M)
- New Business Development (BD), Marketing ,Tendering & Order Booking
- Procurement & Negotiations
- New Product development
- Commercial Management (Cost control, Risk Analysis , Insurance & Claims Management)
- Project Management including Planning , Monitoring Execution & Control
- Customer relationship & Liaisioning with Govt. for Statutory Clearance
- Quality & Safety
- Team building & development
- P &L Management

Sharad Kumar - Founder

Sharad Kumar is the Founder of Eurja. He specializes in building businesses, project development, investment management and project finance in the Logistics sector. He has a rich experience in Sales, business development , Contracts & Procurement . Sharad has worked with Shapoorji Pallonji , J.M Baxi,BDP , SAR Transport at various decision making positions.

About Eurja

VISION

To become an integral part of our customer's plans, processes & fulfill their engineering, designing & implementation needs

MISSION

To provide complete EPC solution from concept to commissioning of the engineering process.

Our Values

- **T**rue for Yourself & Customer
- **R**eliable & Responsible To Stake Holders
- **U**rge For Excellence
- **S**ystem Oriented
- **T**ransparency In Working

Why Eurja

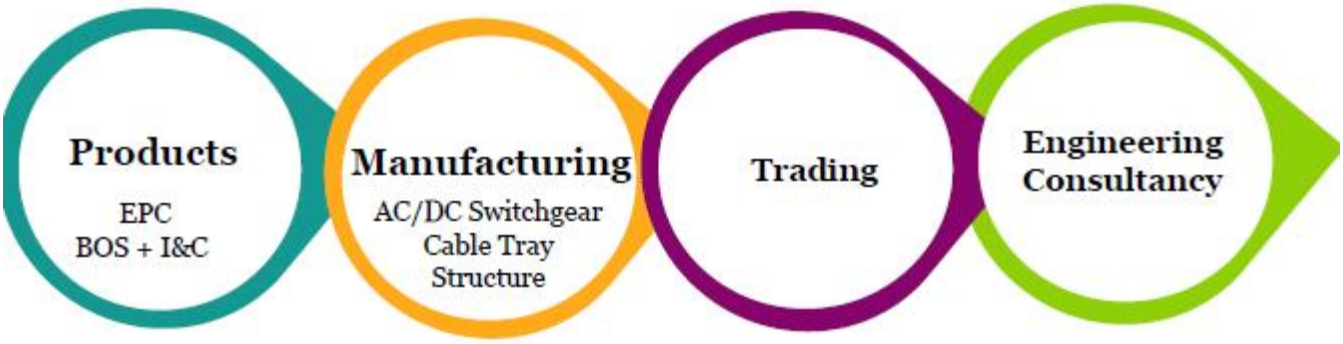
- YOUNG TEAM
- SOLAR EXPERTISE
- ROOFTOP FOCUS
- FLEXIBLE BUSINESS MODEL
- AGILITY & RESPONSIVENESS

Your **Single Window** for

urja

Products & Services

Business Areas



Our Projects

For more details , Please visit to drishti.eurja.com

Journey so far....

2016 — Incorporation

2017
- 1st GCRT & Ground Mount SPV Plant
- Started Manufacturing

2018
- 500 kW rooftop plant in Mumbai
- Registered with CEIG & MEDA
- 1300 kW for CRPF

2019
- 1st Project for Cricket Stadium
- NSIC & ISO Certified,
- Branch office in Jharkhand

2020
- 1st 500 kW PPA
- 1st Project in Banking
- Conceptualized IOT , T&D Vertical

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ORGANISATION STRUCTURE

- We promoters have two organisations with same sharing patter for Organisation 1: EURJA INFRASTRCUTURE (EI) (Promoter Company) & Organization 2 : EURJA ENERGY GENERATION PRIVATE LIMITED (EEGPL) (Applicant Company). Prashant Tiwari & Sharad Kumar are Partners & Directors of both the Group company with equal share holding.
- Presently all the PPA, experience, Financial experience is with Organization 1 (EI). However the promoters propose to Assign the PPA to Organization 2 (EEGPL). It is proposed that EEGPL will be the Developing organization & EI will perform EPC for the project.
- Applicant for the Loan is EEGPL.
- However all past experience, financial documents of Eurja Infrastructure (Organization 1) is attached for needful.
- Organization 2 (EEGPL) is the newly formed organization. All other details are attached herewith

ORGANISATION: 1 (PROMOTER COMPANY)	
ORGANISATION	EURJA INFRASTRCUTURE (EI)
TYPE	PARTNERSHIP
OWNERS	PARSHANT TIWARI (50%) & SHARAD KUMAR (50%)
NATURE OF BUSINESS	CAPEX - SOLAR PV POWER PLANT , ENGINEERING CONSULTANCY , TRADING & MANUFACTURING
ESTABLISHMENT	2016
STATUS / EXPERIENCE	PARENT COMPANY / 6 EXPERIENCE
CERTIFICATION	MSME/NSIC/ISO/ELECTRICAL INSPECTOR
TURNOVER	FY 20-21 : 4.83 CR
	FY19-20 : 2.87 CR
	FY18-19 : 2.76 CR
PROFIT	FY 20-21 : 0.05 CR
	FY19-20 : 0.15 CR
	FY18-19 : 0.03 CR
BANKING LIMITS	SECURED : 1.50 CR
	UNSECURED : 3.02 CR
PARTNERS CAPITAL	0.71 CR
NET WORTH	FY 20-21 : 0.72 CR
	FY19-20 : 0.92 CR
	FY18-19 : 0.08 CR

ORGANISATION: 2 (APPLICANT COMPANY)	
ORGANISATION	EURJA ENERGY GENERATION PRIVATE LIMITED (EEGPL)
TYPE	PRIVATE
DIRECTORS	PARSHANT TIWARI & SHARAD KUMAR
NATURE OF BUSINESS	PROJECT DEVELOPER (RESCO) - SOLAR PV POWER PLANT
ESTABLISHMENT	2021
STATUS / EXPERIENCE	NEW ORGANISATION
CERTIFICATION	NIL
TURNOVER	NIL
PROFIT	NIL
BANKING LIMITS	NIL
PROMOTERS CONTRIBUTION	0.70 CR

→ "EI" is the parent company with all experience in Solar Power plant & ownership of PPA

→ "EEGPL" is the new company (Applicant) which proposes to be the ownership of PPA

→ "EI" will assign all the PPA to "EEGPL" (Assignment is in process)

→ "EI" proposes to restrict itself for projects under CAPEX mode & "EEGPL" to undertake all RESCO projects as a developer.

→ "EEGPL" will allot all future EPC to "EI".

CERTIFICATION

We have received below mentioned Certification / Approvals / Empanelment

- Licenced Electrical contractor from Chief Electrical Inspector General of Maharashtra
- ISO 9001 & 14001
- Licenced Electrical contractor for Adani Electricity Mumbai
- MSME
- NSIC

Empaneled at

- Municipal Corporation of Greater Mumbai
- MEDA - Maharashtra
- JBVNL - Jharkhand
- JUSCO (Tata Power – Jamshedpur)

Worked as contractor for

- Jharkhand State Cricket Association (JSCA)
- Water Department of Maharashtra (MJP) – MEETRA
- Ujjain Smart City , Government of MP
- Kerala State Electricity Board (KSEB)
- State Bank of India , Jharkhand & Bihar
- Military Engineering Services (MES)

Refer Schedule 5 for more details on Organisation profile & Work Completed / work in hand

PROJECT AT A GLANCE

PROJECT

Installation of GCRT Solar Photo Voltaic Power plant on various Government Buildings in Maharashtra under RESCO / OPEX mode with (Subsidy) CFA from MEDA/ MNRE

HIGHLIGHTS OF THE SCHEME

The projects may be implemented under CAPEX or RESCO mode. The details of the scheme are mentioned below

FOR CAPEX mode:

The Project financial are as mentioned below

Description	Value	Unit	Remarks
Benchmark Cost as per MNRE	45,000	INR /kW	Including SITC + 5 years CSMC , Transportation & Taxes
CFA (Subsidy)	13,250	INR /kW	For 10kW to 100kW project size
Actual cost	31,750	INR /kW	
Return on Investment	Less than 5	Years	Calculated for 100 % equity.
Total Life of plant	25	Years	

FOR RESCO mode

- Developer will invest, install & maintain Solar Power plant on Roof. No upfront investment by End user.
- A Power purchase agreement (PPA) to be signed between developer & end user.
- A tariff of INR 2.7395 per unit to be paid to developer by end user for energy generated for an agreement period of 25 year.
- Subsidy shall be availed by developer.

PROJECT BRIEF

→ Eurja Infrastructure (Developer) will invest, install & maintain Solar Power plant on Roof for a period of 25 years. No upfront investment by Government Organisations.

→ A Power purchase agreement (PPA) is signed between developer & end user (Government Organisations).

→ A tariff of INR 2.7395 (Say 2.74) per unit to be paid to developer by end user (Government Organisation) for energy generated for an agreement period of 25 year.

→ Subsidy shall be availed by Eurja

→ Eurja proposes to install projects up to 5 MW under scheme.

Site Address	Maharashtra (Mumbai , Akola , Thane , Nanded, Jalgaon , Sangli & Pune)
Nearest Major Airport	Mumbai / Pune / Nagpur
Type of Project	Grid Connected Roof Top on Government Buildings
Proposed Capacity	5 MW
Expected Plant Commissioning Date	31st Dec 2021
Project energy Generation	7.2 Million kWh
Use of Energy Generated	Captive Consumption & settlement of excess energy exported to grid through Net Metering as per MERC policy. (Billing to consumer shall be for Energy generated)
Energy Sale Agreement arrangement	Power Purchase Agreement (PPA)
Power tariff	INR 2.74 / kWh
PPA Duration	25 years
Total Cost of 5 MW Project	17.92 Cr
Equity (25 %)	04.47 Cr
Debt (75 %)	13.44 Cr
CFA (Subsidy)	06.62 Cr
Project IRR & Payback	12.59 % & 6 years
Equity IRR & Payback	17.25 % & 5 years
DSCR	1.33

The main objective of this project is to save on purchase of grid electricity by generating own clean energy and thereby achieving monetary savings year on year for the next 25 years. Additionally, because the cost of energy generated by solar project would remain constant for the full project period, it would provide the proponent insulation from increasing grid energy cost.

The advantages of adopting solar photovoltaic technology are:

- No need of arranging, maintaining and feeding fuel
- Operating cost is practically nil, except for manpower for cleaning modules
- No special manpower necessary for operating and maintaining these systems
- This is a proven technology and has been used successfully globally and in India for many decades
- The components are standardized and reliable
- No moving parts and hence no wear and tear
- Main component, solar module, comes with 25 years performance warranty

PROPOSED PROJECT AND THE SCHEME

SOLAR IN MAHARASHTRA

All solar Power generated in Maharashtra shall adhere to MERC Net Metering Policy 2015 along with its latest amendment.

There are below mentioned Power utilities in Maharashtra

Name f Distribution Licensee (Utility)	Area	Project under utility
Adani Electricity	West, North & Central Mumbai.	MES – Kalina (300kW) & Kandivali , SEEPZ
Tata Power	Central & East Mumbai	MES – Kalina (200kW)
BEST	South Mumbai	MES – Colaba
MSEDCL	Central Mumbai , Thane & rest of the parts of Maharashtra	SGGS , PDKV , BSNL , PAL , COL

PROJECT LOCATION

Sr. No	**Name of the Beneficiary**	**Project Location**	**Project Capacity (kWp)**	**CODE**
1	Military Engg. Services Garrison Engg., Santacruz East Mumbai (Kandivali)	Military Engineering. Services Garrison Engineer North at Central Ordnance Depot & AFSMD , Kandivali (E) , Mumbai , Maharashtra 400101 . On roof of a) Cold Storage Room b) Shivaji Chowk Building	200	MES
2	Military Engg. Services Garrison Engg., (west) Colaba , Mumbai	Military Engineering. Services Garrison Engineer West , Colaba , Mumbai , Maharashtra. On roof of a) 15 Punjab & CMP Parking area b) CMP Civil GT & Embarkation MT shed	500	MES
3	Military Engg. Services Garrison Engg., Santacruz East Mumbai (Kalina)	Military Engineering. Services Garrison Engineer North , Kalina , Santacruz East , Mumbai , Maharashtra . On roof of a) MT Parking Roof. b) Canteen roof c) Barrack	500	MES
4	Shree Guru Gobind Singhji Institute of Engg. & Technology, Nanded	Shri Guru Gobind Singhji Institute of Engineering and Technology, (SGGS I E&T), Vishnupuri,Nanded, (Maharashtra State) Pin : 431 606 . On roof of a) Admin building b) IT building c) Girls Hostel d) Centre of Excellence e) Instrumentation Building.	500	SGGS

		f) Production Roof		
5	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola	Dr. Panjabrao Deshmukh Krishi Vidyapeeth P.O. Krishi Nagar , Akola-444104 , Maharashtra. On roof of a) Girls Hostel b) Boys Hostel c) Tissue Culture Building d) Shetkari Sadan	400	PDKV
6	Bharat Sanchar Nigam Ltd (BSNL) Pune	BSNL , Pune , Maharashtra a) Telephone Exchange , Hadapsar , Pune b) BSNL Building Satara Road , Pune	200	BSNL
7	Bharat Sanchar Nigam Ltd (BSNL) Thane	BSNL , Thane , Maharashtra a) Telephone Exchange , Dombivali , Thane b) SES Yeoor , Thane	140	BSNL
8	Bharat Sanchar Nigam Ltd (BSNL) Jalgaon	BSNL , Jalgaon District , Maharashtra a) BSNL building , Jalgaon b) TE Jamner c) BSNL building , Bhusaval d) BSNL building , Chalisgaon e) BSNL building , Almaner f) TE Raver	285	BSNL
9	Bharat Sanchar Nigam Ltd (BSNL) Sangli	BSNL , Sangli district , Maharashtra a) BSNL building , Miraj , Sangli b) BSNL building , Vita , Sangli	90	BSNL
10	District Collector office, Palghar, Thane	District Collector office, Palghar, Thane a) District Headquarter building , Collector Office , Palghar , Thane , Maharashtra	500	COL
11	BSNL Office	Various Building in Mahaarshtra	395	BSNL 2
12	SEEPZ Andheri	SSEPZ , Andheri W , Mumbai , Maharashtra	1000	SEEPZ
13	SP Office Palghar	District Collector office, Palghar, Thane a) District Headquarter building , SP Office , Palghar , Thane , Maharashtra	90	PAL
14	ZP Office Palghar	District Collector office, Palghar, Thane a) District Headquarter building , ZP Office , Palghar , Thane , Maharashtra	200	PAL
	TOTAL		**5000**	

TECHNICAL DESCRIPTION OF SPV PLANT

BASIC SYSTEM DESCRIPTION

Solar Photovoltaic Power Plant consists of solar modules in series and parallel connections; these convert solar radiations into DC electrical power at the pre-determined range of Voltages whenever sufficient solar radiation is available. In order to achieve a higher system voltage, modules are installed in a series arrangement, called a string. These Strings are fed to the Central / String inverters/ Power Control Unit (PCU) to invert solar generated DC power in to conventional 3 phase AC power. AC power from inverters will be linked with the local LT power distribution box for local use or can be exported to the grid.

A. OPERATION PHILOSOPHY

Solar panels mounted in the field generate DC electric power. The DC electric power generated by the solar panels cannot be used directly. The power is fed to the inverters which invert the direct current into grid compliant AC voltage. The system automatically starts up in the morning when the sun gives sufficient radiation and begins to export power to the grid, provided there is sufficient solar energy and the grid voltage, frequency is within the range. If the grid goes out of range the inverter will be immediately disconnected to avoid 'islanding' and reconnect automatically at a pre-determined time after the grid comes back within range.

The basic principal of installation of Solar PV is reduction of utility consumption (Units). The system is so designed that Solar PV generation is given preference over grid supply. The power generated can be directly consumed by interconnecting the same with the existing system. The capacity of SPV are to be interconnected to the system based on best suited load profile of the system, which can directly reduce the Utility electricity consumption.

Solar PV & Grid supply may operate in parallel as per load. However DG & PV will not operate in parallel. i.e. Whenever grid supply fails and DG is operating at that time PV will be OFF. Or in any case when DG is operating PV will be in OFF mode.

Case	PV	Grid	Load	Remark
1	100	0	100	Ideal Situation. Load supplied by PV
2	50	50	100	Partial Load through PV
3	0	100	100	Night or No PV conditions
4	100	100	200	Load increases but PV can supply only up to its limits, Grid to take the additional load.
5	100	-50	50	Extra PV to Grid during low load conditions. (Net metering)

SCOPE OF SUPPLY

The scope of supply shall include supply of new Solar PV System along with all accessories as mentioned below

BILL OF MATERIAL	
Equipment	**Scope of Supply & Installation**
PV - Poly crystalline	✔
String Inverter	✔
Module Mounting Structure	✔
DC Array JB	✔
ACDB	✔
Surge protection in ACDB	✔
Interface with existing power system only one Energy meter	✔
Online web monitoring	✔
Liasioning support for obtaining Net Metering Requirements	✔
Temperature & Irradiance sensors	✔
BOS -1 (DC cable, DC termination , DC cable management , DC Earthing With Earth Pit)	✔
BOS - 2 (AC cable, AC termination , AC cable management , AC Earthing without Earth Pit)	✔
Lightning protection	✔
Associated Civil Works	✔
Module Cleaning system	✔

PV Technology and Optimal Capacity

In order to maximize the electricity generation, the module placement is very important. As sun travels from east to west due south, modules will get maximum exposure to sun if facing south direction. In addition to this, the panels will be arranged with a uniform profile, so as to reduce shadowing effect. There would be no overlapping of panels in the power plant, and this would reduce any losses that could have occurred due to shadowing. To avoid shadow of adjacent strings of modules optimum distance has been calculated.

Design Classification

The proposed system shall be classified as Grid-connected PV System evacuated at 415 voltage level. The system would consist of fixed-tilt arrays at 15-degree angle from the horizontal plane to maximize insolation capture.

PV Module

The proposed design utilizes poly-crystalline silicon modules. The PV module used for power plant will be TUV, CE certified and conform to IEC 61215, 61701, 61730. The modules would be free from Potential Induced Degradation (PID) phenomenon. All parallel and series connections will be done as per IEC/IS standards. The PV

array will be facing south direction to have maximum energy generation throughout the year. PV array will be free from shadows or under tolerating limits.

Module Mounting Structure

The mounting structures on which PV modules are to be placed will be designed as per the IS standards will be tilted at an angle of 15 degrees from the horizontal and will be at a height of 0.3 meters to 0.9 meters on the mounting structures from the ground level, which will ensure proper ventilation and passage for excess air. Optimum distance is to be ensured in between adjacent PV strings to avoid shadow falling from one string on to the other.

DCDB

A PV array disconnect switch will be required in between PV array and inverter ensuring protection of the PV array in case of any hazard. The cables used for the interconnection of PV modules and strings (combination of the modules) shall conform to IEC 60227 / IS 694, IEC 60502 / IS 1554 (Pt. I & II) taking into account all the de-rating factors like temperature and open circuit voltage and other factors mentioned in the standard. The PV arrays will be placed nearby inverter to minimize the cable losses and associated cost.

All the strings will be paralleled in the junction boxes. The junction box will have IP 65 rating ensuring protection against rain, corrosion and other solid objects.

Inverter

Pure sine wave grid connected solar inverter have been selected for converting DC power into AC.

Each inverter is based on highly efficient IGBT technology with generation voltage of 415 Vac, three phase, 50 Hz. The inverters have a Maximum Power Point Tracker (MPPT). The enclosure of the inverter is dust, vermin and water proof. The inverter meets the all requirements as stipulated in IEC 60529, IEC 62103, IEC 721-3-4, EN 60664-1 and EN 61643-11. The inverter coupled to the PV array is suitable in all aspects for operating with the grid.

The interconnection of the inverters with the AC panel is being done with the help of XLPE cables. All the cables are sized as per IS/IEC standards and as per the fault current, which has to flow in case of any fault. Since the module voltage and current vary considerably, depending upon the weather conditions, the inverter needs to move its working point in order to function optimally. The inverter is using MPPT ensuring maximum power extraction from PV array by tracking the array‘s maximum power point. The MPPT is based on buck-boost technology ensuring function of inverter in lowest irradiance level too.

Lightning Protection

The PV mounting area considered is sufficiently covered by existing Lightning spikes; additional lightning protection system is not required, hence not considered in present scope.

Monitoring system

The monitoring system shall monitor the electrical and metrological parameters as given below:

- DC voltage for PV arrays
- Global irradiance
- DC current PV
- DC power PV array
- Grid voltage at inverters
- Ambient temperature
- Grid current for inverters
- Status of all the inverters
- Fault of all the inverters
- Frequency
- Grid voltage
- Grid current
- Active grid power
- Reactive grid power
- Energy value from and into the grid
- Daily energy
- Monthly Energy and Annual energy

Cables

DC cables

Power cables of adequate rating shall be required for interconnection of:

- Modules/panels within arrays- 1CX4 sq mm CU Solar Cable
- Arrays and inverters - 1CX4sq mm CU Solar Cable

Annealed tinned flexible copper conductor Electron Beam Cross Linked XLPO 120 deg C insulated and sheathed Single core 1.8kV DC rated Solar cable as per TUV spec 2Pfg 1169/08.2007 (+ 5 % Tolerance)

AC cable

- Inverters and ACDB – Cu, XLPE , As per IS 1554 , Flexible AC Cable
- AC Distribution Board to Existing - AL, XLPE , As per IS 7098 , Armoured

Circuit breaker

The circuit breaker and accessories will be in general conforming to IEC: 600 56, IS 60947 Part I,II,III , EN 50521 and IS:13118 as applicable. The circuit breaker will be totally re-strike free under all the duty conditions and will be capable of breaking magnetizing current of transformer and capacitive current of unloaded overhead lines without causing over voltages of abnormal magnitudes.

Earthing of Equipment

Earthing is essential for the protection of the equipment and people. Two main grounds used in the power equipment are:

- System earth

- Equipment earth
- LA Earthing

Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earths are bonded together to make them at the same potential. The earthing conductor shall be rated for the maximum short circuit current and shall be 1.56 times the short circuit current. The area of cross-section shall not be less than 1.6 sq mm in any case. The array structure of the PV modules shall be grounded properly using adequate numbers of earthing pits. For earthing design IS-3043 is to be referred.

The grounding of the PV array will provide a well-defined low resistance path from selected points of the PV array to the ground.

Civil Works and Array Structures

The structures for mounting PV modules will be made up of GI / Al and designed to withstand wind loads and dead loads as per site conditions according to IS875:Part-3. The foundation design takes into consideration all the loads from solar PV modules with mounting structures and live loads as per the manufacturer‘s loading data. The design and construction is being done as per provisions laid down in IS Standards. The grade of concrete for the complete foundation shall be at least M-20 as per IS: 456.

Cable trays, Pipes and Conduits

Cable trays, pipes and conduits shall be suitably sized to carry the requisite cables. Necessary embodiments and edge protection angles shall be provided as per functional requirements.

Excess Material Removal

All the materials and equipment employed for construction purpose shall be taken away from the site. All the rubbish and unwanted plant material shall be cleared and dumped away from the site. All areas within and outside the site, which have been used during the construction, shall be cleared and the roof surface shall be left in a safe and aesthetically good condition.

Cable Losses

Power is also lost to resistance in the system wiring. These losses should be kept to a minimum but it is difficult to keep these losses below 3% for the DC system. For this project the total energy loss in the cables has been considered to be 5.0 %.

Boundary Points

Outgoing of Existing Distribution board

Exclusion

- Any modification works on Individual floors other than that required for Solar PV System.
- Electricity Charges & Water charges required during construction.
- Regularization /intimation to statutory agencies unless specifically agreed in Scope
- Dismantling / Removal / Relocation of any tanks, pipes or other structures required for Solar PV installation.

Support form CLIENT

- Storage of Materials
- Water & Electricity required during construction
- Necessary documents required for Approval
- Any other (If required)
- Providing of electrical and civil drawings of the existing systems
- Access for Eurja Infrastructure personnel & the contract workers for carrying out the work.
- The raised structure on the terrace & other temporary structures shall be dismantled at suitable height by client to avoid shadow effect on PV panels.

PROJECT IMPLEMENTATION

SCHEDULE

The project is planned to be implemented at the earliest. The project shall be completed within 90 days from issue of sanction letter for subsidy.

RESPONSIBILITY MATRIX

Steps	**CLIENT**	**Eurja Infrastructure**
Construction Drawing & Documents		√
Site Clearing, shifting or modification. Land / Site Cleaning and site clear approach	√	
Statutory Approvals	Support	√
Supply , Erection, Procurement & Commissioning		√
Project Reporting &monitoring & Handing Over.		√

STATUTORY PERMISSIONS

Sr. No.	Authority	Approval / Information	Remarks
1	Electrical Inspector	Approval	Two Stage Approval is required Stage 1 : At beginning of the project Stage 2 : Before commissioning of project

OPERATION & MAINTENANACE

Schedule : Twice a Month

- Generation data Report analysis
- Generation report submission (Monthly)

Schedule : Quarterly

- Visual Inspection of modules for hotspot
- Checking & Cleaning of Inverters
- Generation data analysis

Schedule : Half yearly

- Checking of tightness of modules
- Checking of AC – DC termination & tightness of bolts at inverters , ACDB , Earthing , LA , Structure

Schedule : Yearly

- Cleaning of ACDB
- Checking of Earth resistance

Schedule : As required

- Breakdown maintenance

RISK & MITIGATION

Sr. No.	COMPONENT	RISK	Reason	Mitigation Method
1	PV Module	Breaking of PV Module Glass	- Due to Falling of Tree - Due to Vandalism - Due to High wind Speed - Lightning Strokes	- Tree trimming carried out at all location before installation & there after periodically on yearly basis. - Awareness in the area through presentation & security. - Module mounting structure is designed for 150 kMph wind speed. - Periodic Tightening of Modules - Installation of Lightning Arrestor
2	Module Mounting Structure	Rusting & damage due to high wind speed & wild animals	- Climate & High Wind Speed - Damage by Wild Animals (Monkeys)	- Periodic inspection application of Zinc Spray on rusted areas. - Module mounting structure is designed for 150 kMph wind speed. - 10 years Warranty for Structures (HDG GI Structure)
3	AC & DC Distribution BOX	Fire	Electrical Hot Spots , due to ageing , equipment failures & loose connection	- Periodic Maintenance of all Boxes as per O&M Schedule. - Preventive maintenance of components.
4	AC & DC Cable & Termination	Fire	Electrical Hot Spots , due to ageing , termination failures & loose connection	- Periodic Maintenance of all joint as per O&M Schedule. - Preventive maintenance of components. - Periodic Thermo vision monitoring of joints
5	Inverter	Fire	Electrical Hot Spots , due to ageing , termination failures & loose connection	- Periodic Maintenance of all joint as per O&M Schedule. - Preventive maintenance of components. - Periodic Thermo vision monitoring of joints
6	O& M Staff	Electrical shock & Falling from roof	Accident	- Periodic Maintenance of all Cable - PPE Kit & Training to staff

QUALITY ASSURANCE PLAN FOR THE PROJECT

Sr No	MATERIAL	SPECIFICATION	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	TYPE OF CHECK	FORMAT OF RECORD	AGENCY	
							EURJA	MEDA
1	PV Modules	335 WP, DCR Polycrystalline PV Modules	1. PV Module Datasheet 2. IEC Test Reports 3. Installation Manual 4. Warranty Certificates	Complying to IEC 61215 2ndEdition, IEC61730, IEC 61701, IEC 62716	Visual	Joint Inspection Report	V	V
			1. Flash test reprot 2. I-V Curve characteristics	As per manufacturing standards & Factory test reports	Electrical	Joint Inspection Report	W	V
2	Inverter	Three Phase solar Grid Tied string Inverter	1. Inverter Datasheet 2. IEC test reports 3. Installation & Operation Manual 4. Warranty Certificates 5. Factory Test Reports	Complying to IEC 62116, IEC 61727, IEC 61683, IEC 60068(1,2,14,30), IEC 62109-1/2, EN 61000-6-1,6-2,6-3,6-4	Visual	Joint Inspection Report	V	V
3	Module Mounting Structure	GI Module mounting structure	1. BOQ 2. GA Drawing 3. STADD Report 4. Certifications of Galvanisation 5. Warranty Certificate	Complies to complies to IS 2629, IS6745 &IS 4759 ,IS2633	Visual	Joint Inspection Report	V	V
4	DC Cable	1Cx 4 Sq mm Cu Solar DC cable	1. GTP 2. Cable Datasheet 3. Test certificates 4. warranty certificates	Complies to IS 694 & EN 50618 specification	Visual	Joint Inspection Report	V	V
5	DCDB	Polycarbonate box Wall mounted IP65	1. BOQ 2. GA Drawing 3.Test reports 4. Warranty Certificate	As per manufacturing standards & GA Drawings	Visual	Joint Inspection Report	V	V
6	ACDB & Isolation Box	Various sizes as per Approved Documents	1. BOQ 2. GA Drawing 3.Test reports 4. Warranty Certificate	As per manufacturing standards & GA Drawings	Visual	Joint Inspection Report	V	V

7	AC Cable	Various sizes	1. GTP2. Cable Datasheet3. Test certificates4. warranty certificates	Conforming to the IS 7098 part 1	Visual	Joint Inspection Report	V	V
8	Earthing Material	As per the tender document	1. BOQ 2. Test reports	As per manufacturing standards & tender specifications	Visual	Joint Inspection Report	V	V
9	Pre Commssioning tests	As per the tender document	1. Equipment Functioning test 2. DC Voltage test 3. Polarity test 4. Contunity test 5. MPPT Power Verification 6. AC voltage test 7. Earth Resitivity test	As per the design documents	Electrical	Joint Inspection Report	P	V
10	Commissioning Test	As per the tender document	Performance Ratio Test	PR= 70%	Measurement	Joint Inspection Report	P	V

LEGEND

V :	Verification	MEDA : Maharashtra Energy Development Agency
P :	Perform	
W :	Witness	

PROJECT FINANCING

REQUIREMENT

Eurja Infrastructure proposes to avail long term loan from SBI various available schemes for establishing of Solar PV power plant in RESCO mode.

We shall be installing a Solar Power plant on roofs & selling power at INR 2.74 units for 25 years to below mentioned client (Government Organization). Operation & Maintenance to be carried out at client premises for 25 years.

SBI will provide loan for the below mentioned project & receives periodic payments by the sale of Energy generated as per loan agreement.

Few of the projects are already completed & balances are in pipeline.

INVESTMENT REQUIREMENT

Client	kW	Gross Investment (INR)	Equity (INR) (25 %)	Debt (INR) (75%)	Subsidy (1 year) (INR)
MES	1200	42,960,000	10,740,000	32,220,000	15,900,000
BSNL	715	25,597,000	6,399,250	19,197,750	9,473,750
SEEPZ	1000	35,800,000	8,950,000	26,850,000	13,250,000
PDKV	400	14,320,000	3,580,000	10,740,000	5,300,000
SGGS	500	17,900,000	4,475,000	13,425,000	6,625,000
COL	500	17,900,000	4,475,000	13,425,000	6,625,000
PAL	290	10,382,000	2,595,500	7,786,500	3,842,500
BSNL2	395	14,141,000	3,535,250	10,605,750	5,233,750
TOTAL	**5000**	**179,000,000**	**44,750,000**	**134,250,000**	**66,250,000**

STAGE 1 : PROJECT DETAILS

Client	kW	Gross Investment (INR)	PROJECT PRESENT STATUS
MES	1200	42,960,000	Commercial Operation Date started for Project. Invoice raised for 1st month generation. Release of subsidy awaited.
PDKV	400	14,320,000	Project partly commissioned. Work in progress
SGGS	500	17,900,000	Project partly commissioned. Work in progress
TOTAL	2,100	75,180,000	

For more details refer Annexure 7

IMPORTANT DATES

Project Completion : By 31st March 2021 (Date extension awaited from MNRE / MEDA due to COVID 19. Blanket approval received from MNRE

Billing Start : From Commercial Operation date. (1200 kWp Completed) realization from July / Aug 21

Assumptions

Project Details

Particular	#UoM	Details
Type of Project		Rooftop
Project Location		Maharashtra
Project Size	kW	5000
Tariff	INR / Unit	2.7395
CUF	%	17.7%
Units Generated	Lacs kWh first year	77.56
Annual Degradation	%	0.90%
Project Cost	INR Lakhs	1,774
IDC	INR Lakhs	15
Project Cost with IDC	INR Lakhs	1,789
Funding		
Debt	%	75%
Equity	%	25%
Debt	INR Lakhs	1,341
Incentive	INR Lakhs	663
Net Debt	INR Lakhs	679
Equity	INR Lakhs	447
Loan Tenure	nos of years	10
Interest Rate	%	8.95%
Moratorium Period	nos of months	6
Financing Charges	%	0.35%
EPC Cost	lakhs per kW	0.35
O&M Cost	Rs Lacs / MW	3
O&M Escalation	%	5.00%
Pre-operative expenses	%	0.10%
Contingency Charges	%	1.00%
Depreciation Rate	%	5.28%
Depreciation Rate 13th yr onward	%	1.78%
Corporate Tax Rate	%	27.75%
MAT	%	16.65%
Tax Depn	%	15%

RESULTS

Payback Period Project	5
Project IRR	12.59%
Payback Period Equity	6
Equity IRR	17.25%
Average DSCR	1.33
Min DSCR	1.21
Min ISCR	3.15
Min FACR	1.35

For more details refer Schedule 7

PV SYST GENERATION REPORT

Total Project is for 5000kW, however this comprises of multiple projects with the individual project capacity 500kW

Typical 500kW Generation details at MES Colaba , Mumbai , Maharashtra

Project summary

Geographical Site
Colāba
India

Situation
Latitude 18,90 °N
Longitude 72,81 °E
Altitude 8 m
Time zone UTC+5,5

Project settings
Albedo 0,20

Meteo data
Colāba
Meteonorm 8,0 (1996-2015) - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation
Fixed plane
Tilt/Azimuth 15 / 0 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information

PV Array
Nb. of modules 1494 units
Pnom total 500 kWp

Inverters
Nb. of units 10 units
Pnom total 500 kWac
Pnom ratio 1,001

Results summary

Produced Energy	792,2 MWh/year	Specific production	1583 kWh/kWp/year	Perf. Ratio PR	83,65 %

Main results

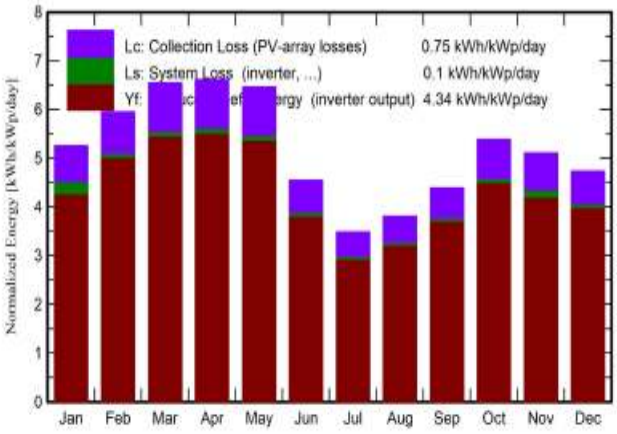
System Production

Produced Energy (P50)	792,2 MWh/year	Specific production (P50)	1583 kWh/kWp/year	Performance Ratio PR	83,65 %
Produced Energy (P90)	761 MWh/year	Specific production (P90)	1520 kWh/kWp/year		
Produced Energy (P95)	752 MWh/year	Specific production (P95)	1503 kWh/kWp/year		

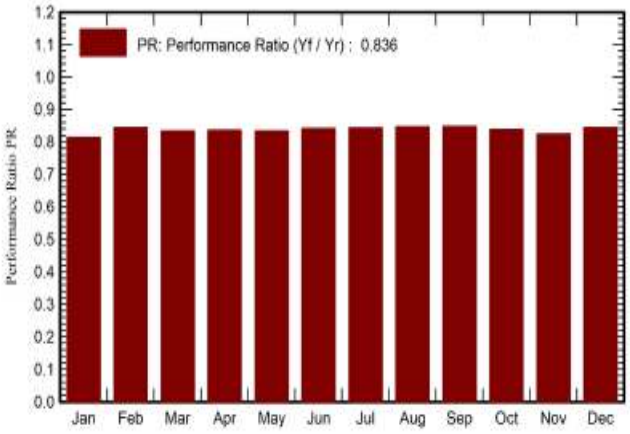
Economic evaluation

Investment		Yearly cost		LCOE	
Global	17'917'542.00 INR	Annuities	1'061'626.74 INR/yr	Energy cost	1.81 INR/kWh
Specific	35,8 INR/Wp	Run. costs	512'027.18 INR/yr		
		Payback period	9,2 years		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	137,9	51,60	24,81	162,9	157,0	70,28	66,38	0,814
February	148,1	56,89	25,89	166,7	161,3	71,68	70,44	0,844
March	190,8	71,12	28,20	203,1	196,4	86,26	84,79	0,834
April	197,5	81,52	28,99	198,3	191,6	84,37	82,94	0,835
May	208,6	90,13	30,23	200,2	192,9	84,97	83,51	0,833
June	143,6	91,33	28,85	136,3	130,5	58,46	57,40	0,841
July	112,7	84,19	28,07	108,0	103,0	46,51	45,60	0,843
August	120,2	86,70	27,80	118,0	113,0	50,96	50,01	0,847
September	129,7	85,38	27,66	131,7	126,1	56,88	55,88	0,848
October	153,8	80,60	29,39	167,0	160,8	71,17	69,99	0,838
November	133,3	61,55	28,17	153,2	147,6	65,49	63,24	0,825
December	124,1	54,19	26,21	146,6	141,4	63,07	61,97	0,844
Year	1800.3	895.19	27.87	1892.2	1821.8	810.10	792.16	0.836

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		

Typical 500kW Generation details at SGGS , Nanded , Maharashtra

Project summary

Geographical Site
Nanded
India

Situation

Latitude	19,16 °N
Longitude	77,31 °E
Altitude	360 m
Time zone	UTC+5,5

Project settings

Albedo	0,20

Meteo data
Nanded
Meteonorm 8,0 (1996-2015), Sat=100% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation
Fixed plane
Tilt/Azimuth 15 / 0 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	1494 units
Pnom total	500 kWp

Inverters

Nb. of units	10 units
Pnom total	500 kWac
Pnom ratio	1,001

Results summary

Produced Energy	826,1 MWh/year	Specific production	1651 kWh/kWp/year	Perf. Ratio PR	83,26 %

Main results

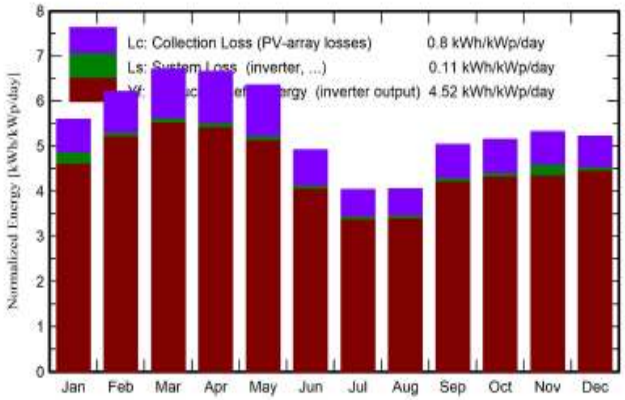
System Production

Produced Energy (P50)	826.1 MWh/year	Specific production (P50)	1651 kWh/kWp/year	Performance Ratio PR	83.26 %
Produced Energy (P90)	793 MWh/year	Specific production (P90)	1585 kWh/kWp/year		
Produced Energy (P95)	784 MWh/year	Specific production (P95)	1567 kWh/kWp/year		

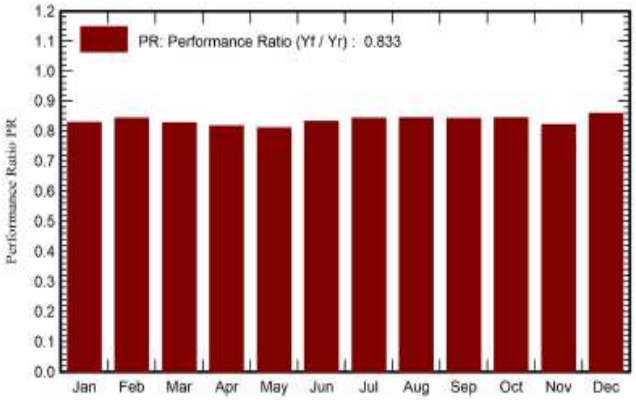
Economic evaluation

Investment		Yearly cost		LCOE	
Global	17'917'542.00 INR	Annuities	1'056'958.45 INR/yr	Energy cost	1.73 INR/kWh
Specific	35.8 INR/Wp	Run. costs	512'027.18 INR/yr		
		Payback period	8.8 years		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	145.8	49.22	21.90	173.3	167.5	75.68	71.89	0.829
February	153.2	53.69	25.39	174.0	168.0	74.56	73.34	0.842
March	194.9	68.98	29.33	208.0	201.0	87.48	86.05	0.827
April	198.7	78.13	32.40	199.7	192.8	83.04	81.62	0.816
May	205.3	87.12	34.70	197.0	189.6	81.31	79.91	0.810
June	155.5	93.69	30.45	147.3	141.0	62.38	61.28	0.831
July	130.8	88.13	27.93	125.1	119.4	53.71	52.72	0.842
August	128.2	80.00	27.01	125.7	120.4	54.06	53.05	0.843
September	146.9	72.67	27.03	151.1	145.4	64.76	63.62	0.841
October	146.9	72.60	26.88	159.7	154.2	68.63	67.41	0.843
November	137.5	55.27	23.96	159.7	154.0	69.26	65.60	0.821
December	134.6	49.45	21.67	161.9	156.0	70.78	69.58	0.859
Year	1878.2	848.94	27.39	1982.4	1909.1	845.66	826.09	0.833

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		

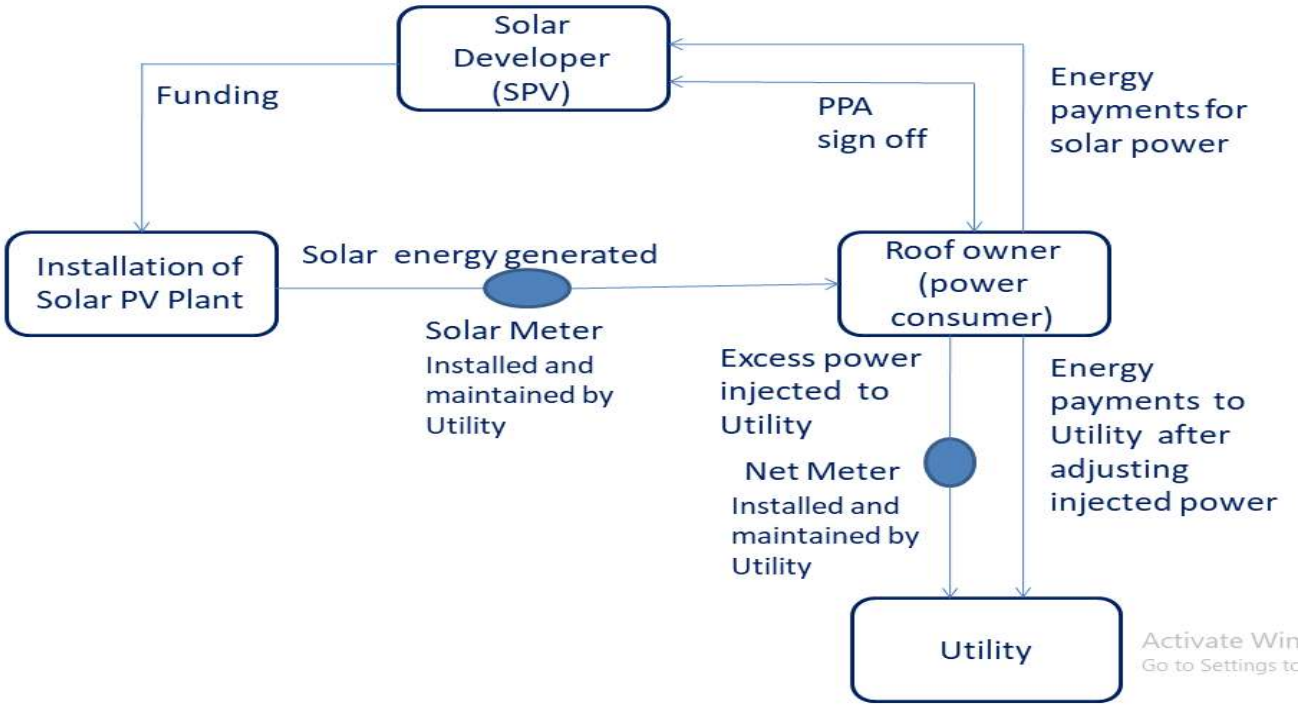
For more details refer Schedule 6

ANNEXURE 1: Working of GCRT Solar PV Power plant

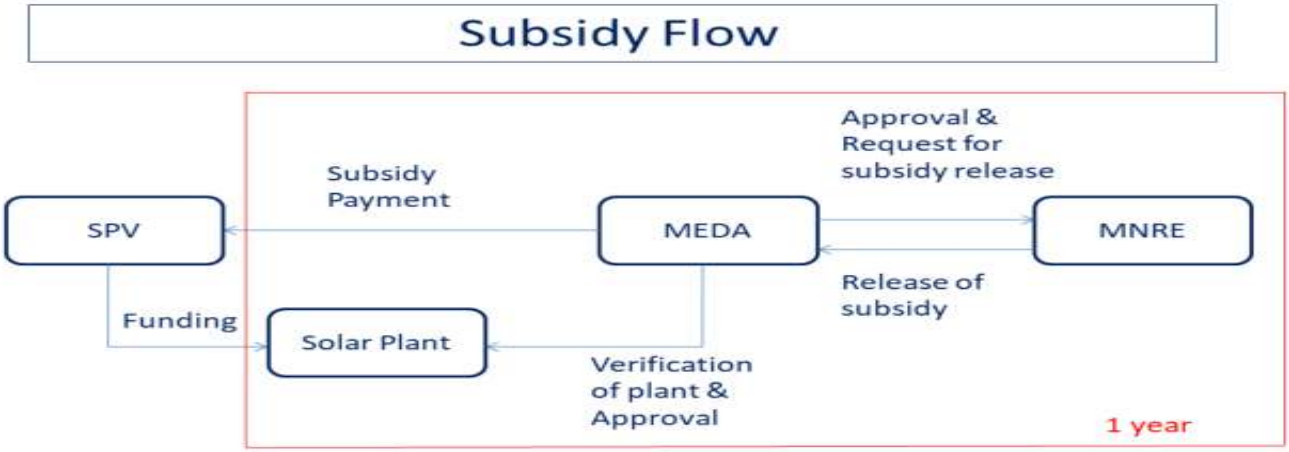
Physical Feasibility Availability of Space Type of Roof & Orientation Dust Levels Shadow effect at the site Seasonal variations **Grid Reliability** Load shedding pattern DG back facility Load Pattern **Regulatory Environment** Net metering policy,	

Annexure 2: Flow of Funds – Energy Sales

RETURN ON INVESTMENT



Annexure 3: Flow of Funds - Subsidy



Annexure 4: Tariff for 25 years

Year 1	INR 2.7395 /kWh
Year 2	INR 2.7395 /kWh
Year 3	INR 2.7395 /kWh
Year 4	INR 2.7395 /kWh
Year 5	INR 2.7395 /kWh
Year 6	INR 2.7395 /kWh
Year 7	INR 2.7395 /kWh
Year 8	INR 2.7395 /kWh
Year 9	INR 2.7395 /kWh
Year 10	INR 2.7395 /kWh
Year 11	INR 2.7395 /kWh
Year 12	INR 2.7395 /kWh
Year 13	INR 2.7395 /kWh
Year 14	INR 2.7395 /kWh
Year 15	INR 2.7395 /kWh
Year 16	INR 2.7395 /kWh
Year 17	INR 2.7395 /kWh
Year 18	INR 2.7395 /kWh
Year 19	INR 2.7395 /kWh
Year 20	INR 2.7395 /kWh
Year 21	INR 2.7395 /kWh
Year 22	INR 2.7395 /kWh
Year 23	INR 2.7395 /kWh
Year 24	INR 2.7395 /kWh
Year 25	INR 2.7395 /kWh

Annexure 5: Typical Generation for 25 years

(Approx for 500kWp) (For Reference Only)

End of Year	Yearly Degradation 'MWh' (Modules & System) Degradation consider in PV system generation data	Energy injected into grid (E_Grid) 'MWh' Yearly 'A'
1	1.00%	700800
2	1.00%	693792
3	1.00%	686854
4	1.00%	679986
5	1.00%	673186
6	1.00%	666454
7	1.00%	659789
8	1.00%	653191
9	1.00%	646659
10	1.00%	640193
11	1.00%	633791
12	1.00%	627453
13	1.00%	621179
14	1.00%	614967
15	1.00%	608817
16	1.00%	602729
17	1.00%	596702
18	1.00%	590735
19	1.00%	584827
20	1.00%	578979
21	1.00%	573189
22	1.00%	567457
23	1.00%	561783
24	1.00%	556165
25	1.00%	550603

Annexure 6: Salvage Value of the Project

Purchase Price for 100-500 kWp system @ Rs. 2.7395 /- Watt.	
Year	**Salvage Value (Rs. / kWp)**
1st year	45,000
2nd year	43,200
3rd year	41,400
4th year	39,600
5th year	37,800
6th year	36,000
7th year	34,200
8th year	32,400
9th year	30,600
10th year	28,800
11th year	27,000
12th year	25,200
13th year	23,400
14th year	21,600
15th year	19,800
16th year	18,000
17th year	16,200
18th year	14,400
19th year	12,600
20th year	10,800
21st year	9,000
22nd year	7,200
23rd year	5,400
24th year	3,600
25th year	1,800

ANNEXURE 7 : PRESENT STATUS OF PROJECT

Summary

Sr. No	Name of the Beneficiary	Project Capacity (KW)	Remark	CODE
1	Military Engg. Services Garrison Engg., Santacruz East Mumbai (Kandivali)	200	Project completed Project file submitted to MEDA .Release of subsidy amount awaited from MEDA (Rs.26.5 Lakhs) . Refer Schedule 1A for Project site Photographs , Site Map (Plot plan)	MES
2	Military Engg. Services Garrison Engg., (west) Colaba	500	Project completed Project file submitted to MEDA .Release of subsidy amount awaited from MEDA (Rs.66.25 Lakhs) Refer Schedule 1B for Project site Photographs , Site Map (Plot plan)	MES
3	Military Engg. Services Garrison Engg., Santacruz East Mumbai (Kalina)	500	Project completed Project file submitted to MEDA .Release of subsidy amount awaited from MEDA (Rs.66.25 Lakhs) Refer Schedule 1C for Project site Photographs , Site Map (Plot plan)	MES
4	Shree Guru Gobind Singhji Institute of Engg. & Technology, Nanded	500	Project partly completed Project file to be submitted by Eurja	SGGS
5	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola	400	Project partly completed Project file to be submitted by Eurja	PDKV
6	Bharat Sanchar Nigam Ltd (BSNL) Pune	200	Awaited for date extension from MEDA	BSNL
7	Bharat Sanchar Nigam Ltd (BSNL) Thane	140	Awaited for date extension from MEDA	BSNL
8	Bharat Sanchar Nigam Ltd (BSNL) Jalgaon	285	Awaited for date extension from MEDA	BSNL
9	Bharat Sanchar Nigam Ltd (BSNL) Sangli	90	Awaited for date extension from MEDA	BSNL
10	District Collector office, Palghar, Thane	500	Awaited for date extension from MEDA	COL
11	BSNL Office	395	We will submit PPA once extension is received	BSNL 2
12	SEEPZ Andheri	1000	We will submit PPA once extension is received	SEEPZ
13	SP Office Palghar	90	We will submit PPA once extension is received	PAL
14	ZP Office Palghar	200	We will submit PPA once extension is received	PAL
	TOTAL	**5000**		

Detailed Status

Sr. No	Name of the Beneficiary	Project Capacity (KW)	PPA Signed	Site Handed Over	Material Supplied	Installation Completed	Commissioning	Commercial Operation
1	Military Engg. Services Garrison Engg., North Santacruz East Mumbai (Kandivali)	200	YES	YES	YES	YES	YES	YES
2	Military Engg. Services Garrison Engg., (west) Colaba	500	YES	YES	YES	YES	YES	YES
3	Military Engg. Services Garrison Engg.,North Santacruz East Mumbai (Kalina)	500	YES	YES	YES	YES	YES	YES
4	Shree Guru Gobind Singhji Institute of Engg. & Technology, Nanded	500	YES	YES	YES	YES	YES	NO
5	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola	400	YES	YES	YES	YES	YES	NO
6	Bharat Sanchar Nigam Ltd (BSNL) Pune	200	YES	YES	NO	NO	NO	NO
7	Bharat Sanchar Nigam Ltd (BSNL) Thane	140	YES	YES	NO	NO	NO	NO
8	Bharat Sanchar Nigam Ltd (BSNL) Jalgaon	285	YES	YES	NO	NO	NO	NO
9	Bharat Sanchar Nigam Ltd (BSNL) Sangli	90	YES	YES	NO	NO	NO	NO
10	District Collector office, Palghar, Thane	500	YES	YES	NO	NO	NO	NO
11	BSNL Office	395	SUBMITTED	NO	NO	NO	NO	NO
12	SEEPZ Andheri	1000	SUBMITTED	NO	NO	NO	NO	NO
13	SP Office Palghar	90	SUBMITTED	NO	NO	NO	NO	NO
14	ZP Office Palghar	200	SUBMITTED	NO	NO	NO	NO	NO
	TOTAL	**5000**						

ANNEXURE 8 : STATUTORY APPROVAL & STATUS

Status of various necessary clearances/approvals required for the project as per the state and central agencies requirement

Project Details:

Name of the Project	Grid Connected Project Roof Top Solar PV Project On Government Building under RESCO Mode at different location in the State of Maharashtra Project.
Project Location	Multiple locations in Maharashtra
Project Capacity in MW	5 MW

Necessary Clearance & approvals required for project execution:

Sr. No.	Authority	Approval /Permission	Remarks
1	State Utility (MSEDCL/BEST/Adani /Tata Power)	Net Metering Approval	Stage 1: Feasibility of SPV Solar Plant State 2 : Sanction for Net Metering
2	Chief Electrical Inspector General (CEIG)	Sanction & Charging Permission	Stage 1 : At beginning of the project Stage 2 : Before commissioning of project

CEIG approval Applicability in Maharashtra:

1) All plants above 500 kW shall obtain approval from CEIG (Applicable for Central Govt. & Ministry of defense building only). Refer attachment 1 for further details.
2) All plants above 200 kW shall obtain approval from CEIG (Applicable for Govt. of Maharashtra building only). Refer attachment 2 for further details.

Sr. No.	Projects under Central Govt. & Ministry	Projects under Maharashtra Govt
1	MES Colaba , Mumbai	Sri Guru Gobind Singh College of Engineering, Nanded
2	MES Colaba , Mumbai	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth Akola,Akola
3	MES kalina santacruz , Mumbai	Resident Deputy Collector, Palghar
4	Bharat Sanchar Nigam Limited	

Project wise Statutory Approval Required

Sr. No.	Project name	Project Capacity (kW)	Net Metering	CEIG
1	MES Colaba , Mumbai	500	Yes	NA
2	MES kalina santacruz , Mumbai	500	Yes	NA
3	Ordnance factory kandivali , Mumbai	200	Yes	NA
4	Sri Guru Gobind Singh College of Engineering, Nanded	500	Yes	Yes
5	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth Akola,Akola	400	Yes	NA
6	Bharat Sanchar Nigam Limited	715	Yes	NA
7	Resident Deputy Collector, Palghar	500	Yes	NA

Status of the Clearance & approvals:

Sr. No.	Project name	Project Capacity (kW)	Net Metering Status	CEIG Status
1	MES Colaba , Mumbai	500	Completed	NA
2	MES kalina santacruz , Mumbai	500	Completed	NA
3	Ordnance factory kandivali , Mumbai	200	Completed	NA
4	Sri Guru Gobind Singh College of Engineering, Nanded	500	Sanction Letter Received, Meter to be installed	Application submitted Map approval to be received
5	Dr. Panjabrao Deshmukh Krishi Vidhyapeeth Akola,Akola	400	Net Metering application submitted & Sanction letter to be received	NA
6	Bharat Sanchar Nigam Limited	715	Net Metering application submitted & Sanction letter to be received	NA
7	Resident Deputy Collector, Palghar	500	Net Metering application submitted & Sanction letter to be received	NA

ANNEXURE 9: PROJECT COST BREAKUP

Total Project is for 5000kW, however this comprises of multiple projects with the individual project capacity 500kW

Cost Break up for 5 MW

	Description	Amount	GST	GST Amount	Total
1	PV Module - Polycrystalline 335Wp	85,159,800	5%	4,257,990	89,417,790
2	Module Mounting Structure	12,884,730	18%	2,319,251	15,203,981
3	M20 Grade Foundation	3,589,850	18%	646,173	4,236,023
4	Solar Inverter	15,270,000	5%	763,500	16,033,500
5	Remote Monitoring System	150,000	18%	27,000	177,000
6	DCDB	928,000	18%	167,040	1,095,040
7	DC Cable	1,236,000	18%	222,480	1,458,480
8	AC Cable	3,950,380	18%	711,068	4,661,448
9	PVC Heavy Duty Rigid Conduits - Black (LHSFT)	1,070,380	18%	192,668	1,263,048
10	GI Cable Tray	292,480	18%	52,646	345,126
11	Basement Panel Board -	930,000	18%	167,400	1,097,400
12	AC Distribution Panel Board -	1,900,000	18%	342,000	2,242,000
13	Lightening Arrestor	926,000	18%	166,680	1,092,680
14	Weather Monitoring system	353,600	18%	63,648	417,248
15	Earthing	460,500	18%	82,890	543,390
16	Earth Pit	1,225,000	18%	220,500	1,445,500
17	Module Cleaning System	620,000	18%	111,600	731,600
18	Installation , Testing & Commissioning	7,020,000	18%	1,263,600	8,283,600
19	Termination Accessories	288,210	18%	51,878	340,088
20	Others	3,031,000	18%	545,580	3,576,580
21	Engineering Consultancy	5,000,000	18%	900,000	5,900,000
22	Ladder / Safety Line	2,000,000	18%	360,000	2,360,000

	Total (Supply & Installation)	**148,285,930**		**13,635,593**	**161,921,523**
22	Freight	2,400,000		-	2,400,000
23	Insurance	500,000		-	500,000
24	Spare Cost	650,000		-	650,000
25	Electrical Inspector/CEIG Approval	200,000		-	200,000
26	Net-Metering	450,000		-	450,000
27	Breakdown Maintenance / Shadow Analysis	500,000		-	500,000
28	Inspection Charges	250,000		-	250,000
29	Manpower (Supervision)	400,000		-	400,000
30	Local Travelling - Employees	250,000		-	250,000
31	Salary & Overheads - Project Management Expenses	6,000,000		-	6,000,000
32	Lodging	250,000		-	250,000
33	Boarding	200,000		-	200,000
34	Assets (Required For Construction)	800,000		-	800,000
35	Management travelling	150,000		-	150,000
36	Printing Expenses	150,000		-	150,000
	Total Overheads	-			**13,150,000**
A	**Total Supply , Installation & Overheads**	-			**175,071,523**
B	**Preoperative Expenses**	**645,000**			**645,000**
C	**Interest During Construction**	**1,805,000**			**1,805,000**
D	**Contingency**	**1,750,000**			**1,750,000**
E = A + B + C + D	**Total**	-			**179,271,523**

Cost Break up for a sample project of typical 500kW is mentioned below.

	Description	Amount	GST	GST Amount	Total
1	PV Module - Polycrystalline 335Wp	8,515,980	5%	425,799	8,941,779
2	Module Mounting Structure	1,288,473	18%	231,925	1,520,398
3	M20 Grade Foundation	358,985	18%	64,617	423,602
4	Solar Inverter	1,527,000	5%	76,350	1,603,350
5	Remote Monitoring System	15,000	18%	2,700	17,700
6	DCDB	92,800	18%	16,704	109,504
7	DC Cable	123,600	18%	22,248	145,848
8	AC Cable	395,038	18%	71,107	466,145
9	PVC Heavy Duty Rigid Conduits - Black (LHSFT)	107,038	18%	19,267	126,305
10	GI Cable Tray	29,248	18%	5,265	34,513
11	Basement Panel Board -	93,000	18%	16,740	109,740
12	AC Distribution Panel Board -	190,000	18%	34,200	224,200
13	Lightining Arrestor	92,600	18%	16,668	109,268
14	Weather Monitoring system	35,360	18%	6,365	41,725
15	Earthing	46,050	18%	8,289	54,339
16	Earth Pit	122,500	18%	22,050	144,550
17	Module Cleaning System	62,000	18%	11,160	73,160
18	Installation , Testing & Commissioning	702,000	18%	126,360	828,360
19	Termination Accessories	28,821	18%	5,188	34,009
20	Others	303,100	18%	54,558	357,658
21	Engineering Consultancy	500,000	18%	90,000	590,000
22	Ladder / Safety Line	200,000	18%	36,000	236,000
	Total (Supply & Installation)	**14,828,593**		**1,363,559**	**16,192,152**
22	Freight	240,000		-	240,000
23	Insurance	50,000		-	50,000

24	Spare Cost	65,000		-	65,000
25	Electrical Inspector/CEIG Approval	20,000		-	20,000
26	Net-Metering	45,000		-	45,000
27	Breakdown Maintenance / Shadow Analysis	50,000		-	50,000
28	Inspection Charges	25,000		-	25,000
29	Manpower (Supervision)	40,000		-	40,000
30	Local Travelling - Employees	25,000		-	25,000
31	Salary & Overheads - Project Management Expenses	600,000		-	600,000
32	Lodging	25,000		-	25,000
33	Boarding	20,000		-	20,000
34	Assets (Required For Construction)	80,000		-	80,000
35	Management travelling	15,000		-	15,000
36	Printing Expenses	15,000		-	15,000
	Total Overheads				**1,315,000**
A	**Total Supply , Installation & Overheads**				**17,507,152**
B	**Preoperative Expenses**	**64,500**			**64,500**
C	**Interest During Construction**	**180,500**			**180,500**
D	**Contingency**	**175,000**			**175,000**
E = A + B + C + D	**Total**				**17,927,152**

Cost Break up for Operation & Maintenance for 1st year is mentioned below.

Sr.No.	Expense	Amount (INR PA)	
		For 500kW	For 5 MW
1	Module Cleaning	90,000	900,000
2	Regular Electrical Maintenance	7,200	72,000
3	Remote Monitoring	900	9,000
4	Spare	10,800	108,000
5	Contingency	10,800	108,000
6	Insurance	12,500	125,000
7	Administrative Charges	9,000	90,000
8	Travelling & Lodging	7,200	72,000
	Total	148,400	1,484,000
	Say	**150,000**	**1,500,000**

SCHEDULE 1 Project Completion Report , Photographs , COD & Site Maps

SCHEDULE 2 : MNRE Notification

SCHEDULE 3 : EOI MEDA

SCHEDULE 4 : Work Order - Eurja

SCHEDULE 5 : Organisation Profile / WCR / W.O / Work in Hand

SCHEDULE 6 : PV syst Generation report

SCHEDULE 7 : Detailed Financial Analysis

SCHEDULE 8 : Project Schedule

SCHEDULE 9: Relevant Standard for Proposed Solar PV system