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(A Govt. of India Enterprise)

Certificate Number
BNSADNB240-2021-1054005



RTTC BHUBANESHWAR

VANI VIHAR, BHUBANESHWAR

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Website : <http://www.orissa.bsni.co.in/rttc>

Tel No. : 0674 - 2589600

CERTIFICATE

This is to certify
JAGANNATH PANDA
of
RAAJDHANI ENGINEERING COLLEGE,
BHUBANESWAR

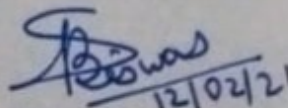
has successfully completed the following Course conducted by
Bharat Sanchar Nigam Limited

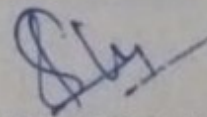
Name of the Course : VT ON ADVANCED IP NETWORKING

Duration : 4 weeks

Commencing Date : 18-01-21

Completion Date : 12-02-21


(SMITA BISWAS)
BATCH-IN-CHARGE


(SARAJU PRASAD PADHY)
PRINCIPAL

Dated : 12-02-21

Course Code : BNSADNB240 Course Schedule Code : BNSADNB240-2021-1054

Registered & Corporate Office: Bharat Sanchar Bhavan, H.C.Mathur Lane, Janpath, New Delhi-110 001



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CIN-U31102OR1985PTC001552

Ref. No.: KT/HR/INT/074

Date : 02/03/2021

This is to certify that Mr./Ms. JITENDRA KUMAR DAS a student of 8th Semester, B.Tech in Electrical Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21

Beulan
Training Head
(Konark Transformer Pvt. Ltd.)





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We wish for her / his better future.

Program Coordinator





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Certificate of Internship

We the undersigned do hereby proudly present this
Certificate of Internship for outstanding honorable effort of

Mr. Jyotiprasad Mohanty

For his successful completion of
Renewable Energy, Rooftop solar PV system at
M/s SOLAMIO AGRO INDIA LLP
from 1st Feb 2021 to 1st April 2021



Solamio-Agro India LLP
AV
Designated Partner

CEO/DESIGNATED PARTNER,
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Certificate of Internship

We the undersigned do hereby proudly present this

Certificate of Internship for outstanding honorable effort of

Mr. Jyotiranjana Behera

For his successful completion of

Renewable Energy, Rooftop solar PV system at

M/s SOLAMIO AGRO INDIA LLP

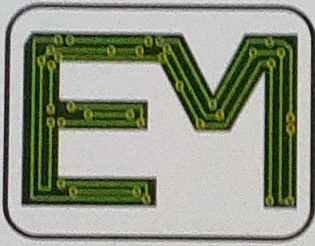
from 1st Feb 2021 to 1st April 2021



Solamio Agro India LLP

Designated Partner

**CEO/DESIGNATED PARTNER,
M/s SOLAMIO AGRO INDIA LLP**



Cert No : ETSP202

EMTRONIK TECHNOLOGY PVT. LTD.

INTERNSHIP CERTIFICATE

This is to Certify that Jyotiranjana Nath of Raajdhani Engineering College

Bhubaneswar has successfully completed his internship at

Emtronik Technology, Bhubaneswar on Solar Power

during the Period from 20th January 2021 to 08th March 2021.

His conduct during the Training Period found to be Satisfactory.

We wish all the success for his future endeavours.



Co-Founder & Director



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This is to certify that

Mr./Mrs..... JYOTI RANJAN SAHOO

has successfully completed her / his Internship program on

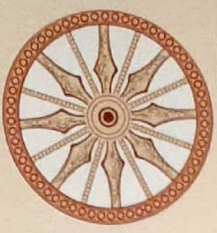
..... INTERNET OF THINGS

in Oltron Technology from FEB 1, 2021 to MARCH 1, 2021

We wish for her / his better future.

Program Coordinator





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Ref. No.: KT/HR/INT/062

Date : 02/03/2021

This is to certify that Mr./Ms. KASIF KHAN a student of 8th Semester, B.Tech in Electrical & Electronics Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21

R. Sulebn
Training Head
(Konark Transformer Pvt. Ltd.)

Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

☎ 0671-2348347, Fax : 0671-2348347

Email.: info@konarktransformer.in



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Pin Code : 751007
Website : <http://www.orissa.bsnl.co.in/rttc>
Tel No. : 0674 - 2589600

CERTIFICATE

This is to certify
MAHESWAR BHOI
of
RAAJDHANI ENGINEERING COLLEGE,
BHUBANESWAR

has successfully completed the following Course conducted by
Bharat Sanchar Nigam Limited

Name of the Course : VT ON ADVANCED IP NETWORKING

Duration : 4 weeks

Commencing Date : 18-01-21

Completion Date : 12-02-21


12/02/21
(SMITA BISWAS)
BATCH-IN-CHARGE


(SARAJU PRASAD PADHY)
PRINCIPAL

Dated : 12-02-21

Course Code : BNSADNB240 Course Schedule Code : BNSADNB240-2021-1054
Registered & Corporate Office: Bharat Sanchar Bhavan, H.C.Mathur Lane, Janpath, New Delhi-110 001



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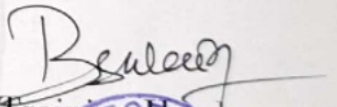
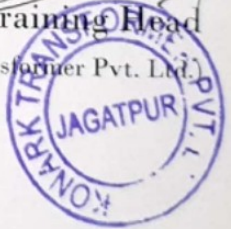
Date: 02/03/2021....

This is to certify that Mr./Ms. MALAYA BEHERA a student of 8th Semester, B.Tech in Electrical & Electronics Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21


Training Head
(Konark Transformer Pvt. Ltd.)


Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

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CIN-U31102OR1985PTC001552

Ref. No.: *KI/HR/INT/064*


Date: *02/03/2021*

This is to certify that Mr./Ms. MALAYA SWAIN a student of 8th Semester, B.Tech in Electrical & Electronics Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: *02/03/2021*
Jagatpur, Cuttack-21

R. Sahoo
Training Head
(Konark Transformer Pvt. Ltd.)


Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

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Ref. No.: *KT/HR/INT/064*

Date: *02/03/2021*

This is to certify that Mr./Ms. MALAYA SWAIN student of 8th Semester, B.Tech in Electrical & Electronics Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: *02/03/2021*
Jagatpur, Cuttack-21

R. Sahoo
Training Head
(Konark Transformer Pvt. Ltd.)

Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

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Tel No. : 0674 - 2589600

CERTIFICATE

This is to certify
MANAS RANJAN BEHERA
of
RAAJDHANI ENGINEERING COLLEGE,
BHUBANESWAR

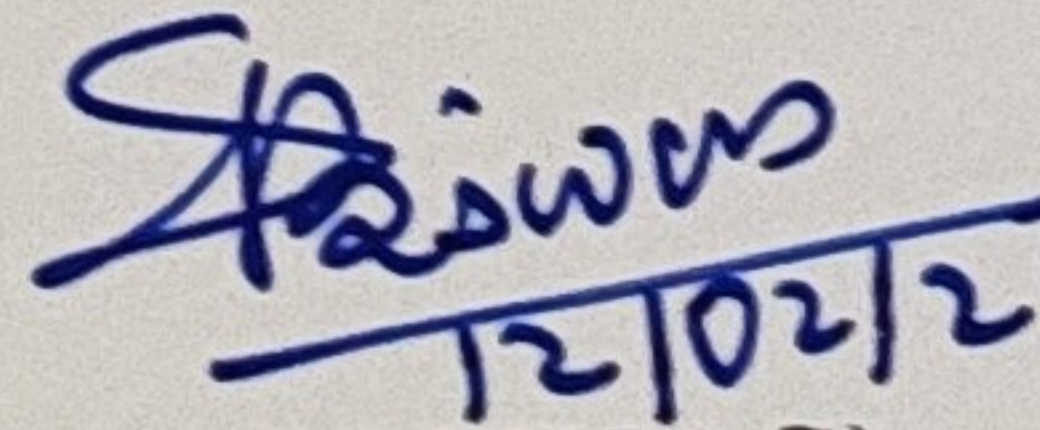
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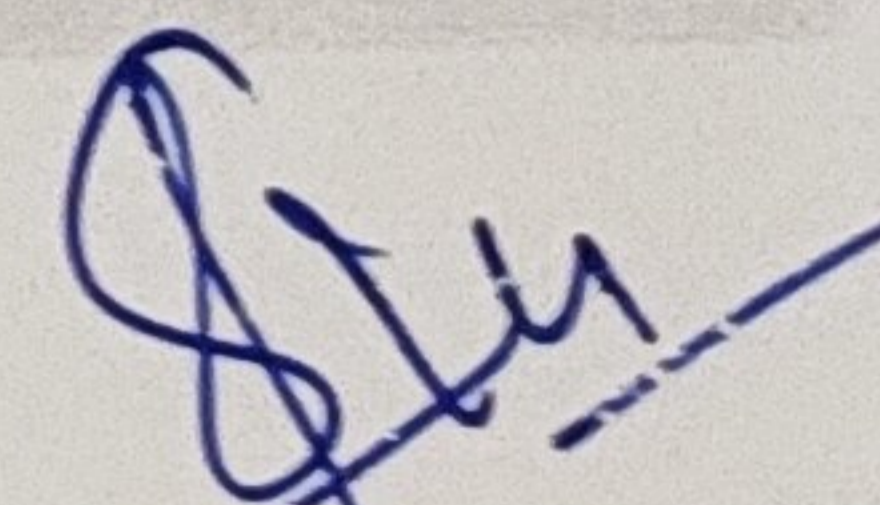
Name of the Course : VT ON ADVANCED IP NETWORKING

Duration : 4 weeks

Commencing Date : 18-01-21

Completion Date : 12-02-21


(SMITA BISWAS)
BATCH-IN-CHARGE


(SARAJU PRASAD PADHY)
PRINCIPAL

Dated : 12-02-21

Course Code : BNSADNB240 Course Schedule Code : BNSADNB240-2021-1054
Registered & Corporate Office: Bharat Sanchar Bhavan, H.C. Mathur Lane, Janpath, New Delhi-110 001

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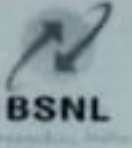
Plot No: 24/1/A, Chandaka Industrial Area, KIIT Campus, Patia, Bhubaneswar - 751024

INTERNSHIP CERTIFICATE

*This is to certify that **Mr. Manoj Kumar Nayak**, student of REC, Bhubaneswar, has undergone Internship at Coaching Depot, Bhubaneswar, **O & M Solutions Private Limited**, during the period from 25th January 2021 to 24th February 2021. His Performance and conduct during the training were good. We wish him success in life.*

Course Co Ordinator

HR Manager



Bharat Sanchar Nigam Limited
(A Govt. of India Enterprise)



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VANI VIHAR, BHUBANESHWAR
Pin Code : 751007
Website : <http://www.orissa.bsni.co.in/rttc>
Tel No. : 0674 - 2589600

CERTIFICATE

This is to certify
MOHAMMED ARQUM MUSIRA
of Raajdhani Engineering College, Bhubaneswar

has successfully completed the following Course conducted by
RTTC, BSNL, Bhubaneswar

Name of the Course : VOCATIONAL TRAINING IN ADVANCE TELECOM

Course Type : Industrial Internship Course (4 Weeks)

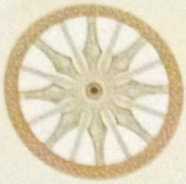
Commencing Date : 15-02-21

Completion Date : 12-03-21

(SMITA BISWAS)
Batch in Charge

Dated : 12-03-21

(SARAJU PRASAD PADHY)
Principal



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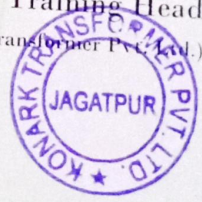
Date : 02/03/2021

This is to certify that Mr./Ms. MONALISA BEHERA a student of 8th Semester, B.Tech in *Electrical Engineering* of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21

Behera
Training Head
(Konark Transformer Pvt. Ltd.)




Sai Electricals

Plot No. : 63, IDCO Industrial Estate
P.O. : Chasapada, Choudwar- 754 027
Cuttack, Odisha
Ph. : 8984113033 / 8456829811
Email : saelectrical2009@gmail.com

Ref No-SE/HR & Admin/2021

Date-02/03/2021

CERTIFICATE OF INTERNSHIP

Name of the Student : MS. MONALISA PRADHAN
College Name : Raajdhani engineering college, Bhubaneswar
Course and Year : B-Tech, 2021
Branch : Electrical Engineering
Training Period : 29.01.2021 to 02.03.2021

TRAINING PERFORMANCE

Subject knowledge : Good
Performance of Training : Good
Learning Initiative : Good
Punctuality : Very Good
Conduct : Very Good
Remarks : she shown keen interest and learning initiative
During the period of training

We wish all success in her prospective career.

FOR SAI ELECTRICALS

M/S. SAI ELECTRICALS

Stishree Pradh
PARTNER

Manager-HR & Admin





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Date: 02/03/2021

This is to certify that Mr./Ms. NIRAKAR MOHAPATRA a student of 8th Semester, B.Tech in Electrical Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

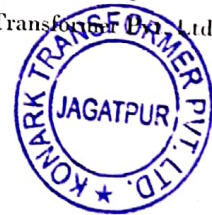
His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21

Bealab
Training Head

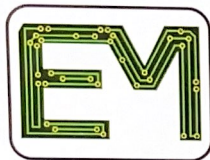
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Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

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Email.: info@konarktransformer.in



Cert No : E.T.P.L. 222

EMTRONIK TECHNOLOGY PVT. LTD.

INTERNSHIP CERTIFICATE

This is to Certify that Nishant Vishwakarma of Raajdhani Engineering College

Bhubaneswar has successfully completed his internship at

Emtronik Technology, Bhubaneswar on Solar Power

during the Period from 20th January 2021 to 08th March 2021.

His conduct during the Training Period found to be Satisfactory.

We wish all the success for his future endeavours.



Co-Founder & Director

27th February 2021

To Whom It May Concern

This is to certify that **Mr. Nishit Kumar Sahoo**, B.E. (EEE – 8th Semester) student of **M/s. Raajdhani Engineering College, Bhubaneswar, Odisha** has undergone the Internship in our Organization for a period of **One month** from **27th January 2021** to **27th February 2021** as a part of partial fulfillment of **Bachelor of Engineering** course.

During the above period his performance and work attitude is satisfactory.

We wish him all the best in his future endeavors.

For **INTEGRATED CLEANROOM TECHNOLOGIES PRIVATE LIMITED**



N. VENKOBA RAO
SENIOR MANAGER – HUMAN RESOURCES

CIN : U29308TG2002PTC039975



COMMUNICATE OFFICE:

201, Srivensai Towers,
Varuna Block,
Kompally, Hyderabad - 500 014.
Telangana INDIA.

CORP. OFFICE :

3rd Floor, Ratna Arcade, Sy. No. 128,
NH-44, Kompally, Hydeabad - 500 014.
Tel : +91-40-27165311, 27165316,
Tel : +91-8897845554,
Fax : +91-40-30995267,

REGD OFFICE :

303, Surabhillotus,
Nagarjuna Nagar Colony, Ameerpet,
Hyderabad-500 073, Telangana. INDIA.
Tel : +91-40-23746468, 23754536
Fax : +91-40-66369804

FACTORY :

Sy. No. 179 to 182,
Yellampet, Medchal -501 401.
Telangana. INDIA.
Tel : +91 8897945554

Cert No : ETSP210



ENTRONIK TECHNOLOGY PVT. LTD.

INTERNSHIP CERTIFICATE

This is to Certify that Nitish Kumar Dash of Raajdhani Engineering College

Bhubaneswar has successfully completed his internship at

Emtronik Technology, Bhubaneswar on Solar Power

during the Period from 20th January 2021 to 08th March 2021.

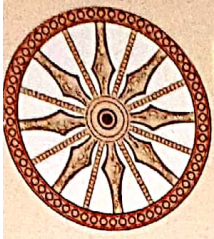
His conduct during the Training Period found to be Satisfactory.

We wish all the success for his future endeavours.



Harid

Co-Founder & Director



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Ref. No.: KT/HR/INT/073

Date : 02/03/2021

This is to certify that Mr./Ms. PRADIPTA BEHERA a student of 8th Semester, B.Tech in Electrical Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21


Training Head
(Konark Transformer Pvt. Ltd.)


Phase -1, New Industrial Estate, Jagatpur, Cuttack, Odisha, PIN-754021

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Email.: info@konarktransformer.in

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An INTERNSHIP REPORT ON SOLAR POWER

Submitted By

*Name- pratap kumar sahuo
Regd. No-1821294236
Branch- Electrical Electronic Engg.*



DEPARTMENT OF ELECTRICAL ELECTRONIC ENGINEERING

Raajdhani Engineering College
Bhubaneswar – 751017, Odisha

Session-2018-21

**BIJU PATNAIK UNIVERSITY OF TECHNOLOGY
ROURKELA, ODISHA**



**An INTERNSHIP REPORT
ON
SOLAR POWER**

Submitted By

***Name- pratap kumar saho
Regd. No-1821294236
Branch- Electrical Electronic Engg.***

*Under the guidance of
Prof Durga Prasanna Mohanty*



DEPARTMENT OF ELECTRICAL ELECTRONIC ENGINEERING

Raajdhani Engineering College

Bhubaneswar – 751017, Odisha

Session-2018-21



BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA
Raajdhani Engineering College, Bhubaneswar, Odisha

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the internship report "SOLAR POWER" in partial fulfillment of the requirements for the award of the Degree of Bachelor in Technology and submitted to the Department of Electrical Engineering, Raajdhani Engineering College, Bhubaneswar, Odisha is an authentic record of my own work carried out during the Academic Session 2018-21 under the supervision of **Prof. Durga Prasanna Mohanty**, Asst. Prof, REC, Bhubaneswar, Odisha.

The matter presented in this dissertation has not been submitted by me for the award of any other degree of this or any other Institute/University.

Pratap kumar sahu
1821294236
B.Tech (EEE)

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

Date:

(Prof. Durga Prasanna Mohanty)

Asst. Professor

Dept. of Electrical Engg.

The B.Tech Viva-Voce Examination of above students has been held on.....

Signature of HOD
Prof. Durga Prasanna Mohanty
Dept. of Electrical Engineering

Signature of External Examiner

Prof. Debashish Parida
Director
Emtronik Technology Pvt. Ltd

ACKNOWLEDGMENT

I am grateful to The Dept. Of Electrical Engineering for giving us the opportunity to execute this internship, which is an integral part of the curriculum in B. Tech programming at the RAAJDHANI ENGINEERING COLLEGE, BHUBANESWAR.

I will greatly thankful to our respected and beloved PRINCIPAL PROF. Dr. BIMAL SARANGI who is the backbone for the success of my Seminar.

I would like to thank PROF. DURGA PRASANNA MOHANTY, HOD Electrical Engineering & Electrical & Electronics Engineering Department for his guidance, support and direction without which internship would not have taken shape.

It is my sincere thanks to all the Faculty Members of my department for their immense support during the research work & also thank the Non-Teaching Staff Members of my department for their kind support and help in carrying out the research work.

And last but not least, I also thank my Parents & Friends for their co-operation and encouragement in successfully completing the internship.

NAME OF THE STUDENT

Pratap kumar sahuo
1821294236
Electrical Electronic Engg.

Abstract

The main purpose of this project work is to find out how renewable energy can contribute in creating value, reducing cost and gaining more profit out of the process. When it comes to methodologies, available literatures on renewable energy and accrued benefits, the same have been covered to extract the most plausible information and data related to how renewable energy can contribute increasing value, reducing cost and overheads. So, an analysis is done on the economically and technological viability of solar panel in Residential Building CLESTA (Planet Godrej), Mumbai. Though the project work was carried out in a Residential Sector, the project work is applicable to both, industrial as well as Institutional sector. This project work has been designed keeping the educational institution in reference.

The three primary burden focuses for example The Primary Block, Secondary Block and the Administrative Block have been recognized as the fitting locales for Solar Photovoltaic usage. A sum of 30 kWp sun oriented PV establishment is proposed. The Electricity produced will be encouraged to the lattice by the assistance of 3 period of net metering, subsequently the sort of the nearby planetary group will be introduced is On-network system.

The benchmark costs for Solar frameworks according to the MNRE standards for the present year (2019-20) have been considered for assurance of endowment.

Capital appropriation of 30% of the benchmark cost might be accessible for CLESTA (Planet Godrej), Mumbai since it is situated in the territory of Maharashtra which isn't under an uncommon classification state. The plausibility has been surveyed and it is discovered that the sun powered usage would prompt tremendous investment funds both as far as money related assets just as ecological assets in the years to come.

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Introduction

Grid Connected Rooftop Solar Programme: Meaning, Significance and Challenges

As we realize that the Cabinet Committee on Economic Affairs has affirmed Phase-II of the Grid Connected Rooftop Solar Program. What are its importance, goal, essentialness and difficulties?

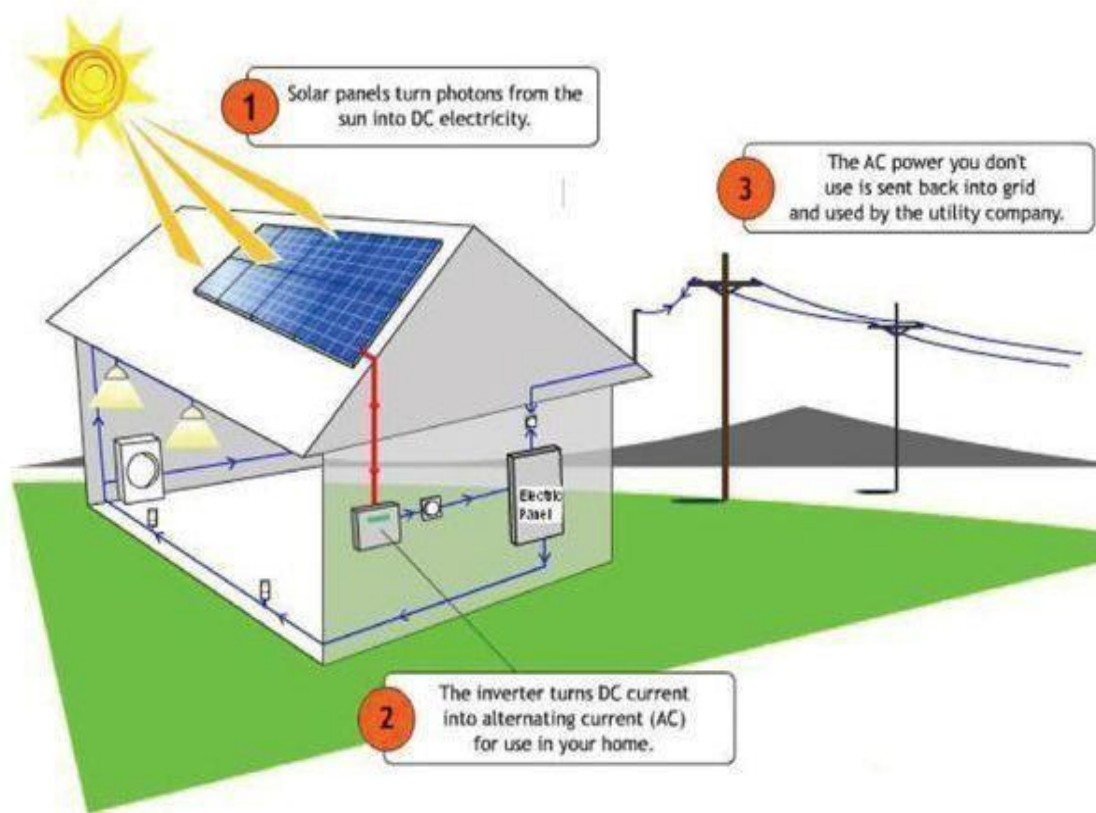
- What is Solar Rooftop System?

In this framework, in any private business, institutional and modern structure, the sun powered boards are introduced in the rooftop. It tends to be of two sorts: Solar Rooftop System having storeroom by utilizing battery and Grid Connected Solar Rooftop System.

- Solar Rooftop System with Storage office: In such kind of a framework battery is there for storeroom.

- Grid Connected Solar Rooftop System: It is otherwise called SPV framework. In this framework the DC power created from SPV board is changed over to AC control by utilizing force molding unit and is bolstered to the matrix both of 33kV/11kV three stage lines, 440/220V three/single stage line contingent on the limit of the framework which is introduced at foundation or business foundation or private complex and the administrative system indicated for individual States.

The power is produced by these frameworks during the day time and is used appropriately by the controlling hostage stacks and send the abundance capacity to the lattice till it is accessible. In the event that because of overcast spread, sun based power isn't sufficient or adequate to run it then the hostage burdens are served by drawing power from the lattice.



- **PHASE II (Solar Program)**

Point of Grid Connected Rooftop Solar Program: is to accomplish a combined limit of 40,000 MW from housetop sun oriented undertakings by 2022. The program will be actualized with an all out monetary help of ₹11,814 crore. The Phase II program accommodates CFA (for private housetop sunlight based establishments) up to 40% for roof frameworks up to 3kW and 20% for those with a limit of 3-10kW. The subsequent stage will likewise concentrate on expanding the dispersion organizations (DISCOM). Execution based impetuses will be given to DISCOMs to accomplish in a money related year (for example first April to 31st March each year till the span of the plan) far beyond the base limit for example total limit toward the part of the arrangement year is accomplished. The impetus to DISCOMs will be as per the following:

Sr.No	Parameter	Incentive
1	For installed capacity achieved upto 10% over & above of installed base capacity* within a financial year.	No incentive
2	For installed capacity achieved above 10% & up to 15% over & above of installed based capacity* within a financial year	5% of the applicable cost** for capacity achieved above 10% of the installed base capacity
3	For installed capacity achieved beyond 15% over & above of installed based capacity* within a financial year.	5% of the applicable cost** for capacity achieved above 10% & up to 15% of the installed base capacity PLUS 10% of the applicable cost for capacity achieved beyond 15% of the installed base capacity.

Table No: 1 CFA Feasibility

*Installed base capacity shall mean the cumulative RTS capacity installed within the jurisdiction of DISCOM at the end of previous financial year. This will include total capacity installed under Residential, Institutional, Social Government, PSU, Statutory/Autonomous bodies, Private Commercial, Industrial Sectors etc.

** applicable cost is the applicable benchmark cost of MNRE for the state/UT for mid-range RTS capacity of above 10kW & upto 100kW or lowest of the cost discovered in the tenders for that State/UT in that year, whichever is lowest.

• **Impact of Grid Connected Rooftop Solar Programme**

- It will have substantial environmental impact as by saving CO2 emissions. It is said that 1.5 million units per MW is considered as an average energy generation and is expected that addition of 38 GW solar rooftop plants under Phase-II by the year 2022 will result in the reduction of emission of CO2 by approximately 45.6 tonnes per year.
- It will also direct the employment potential. This programme will also generate the opportunity for employment that is up to 9.39 lakh job years for skilled and unskilled workers.

◆ **Benefits of Solar Rooftop System**

No doubt it will provide an alternative source of electricity with the help of grid also to companies, residential areas etc. And the main benefit is to the environment by the reduction of CO₂ emissions, it will also reduce the dependence on fossil-fuel generated electricity etc.

- In fact, with the help of Rooftop solar electricity will be provided to those areas which are not connected to the grid that is remote locations and the areas where the higher altitudes makes it difficult to set up power stations and lay power lines.

◆ **Challenges of Solar Rooftop System**

- The main problem with this system is the variability in supply. As, it depends upon the solar energy that is how much bright is sunlight etc. Also, the solar panels don't produce electricity during the night because off-grid locations need more alternative sources of energy.
- Storage may be the solution but this storage technology is still underdeveloped and storage solutions are expensive.

Research Objective

1. Primary Objective:

To determine if CLESTA, Mumbai is viable option for implementation of a 30kW Solar PV project on a standalone mode in technical feasibility & cost effectiveness and making sure their ROI is less than 5 years & its implementations to meet the electricity demand.

2. Secondary Objectives:

Positive outcomes that will occur with the implementation of this study:

- ◆ To understand the Need & Importance of Renewable Energy in this developing nation by reducing greenhouse gas emission & the using less of fossil fuel.
- ◆ Types of Solar System & their Guidelines
- ◆ Benefits of installing Solar System
- ◆ Process of installing Solar System in Residential, Industrial area.
- ◆ How to finance for a particular project
- ◆ Understand the requirements for any Solar system
- ◆ Understanding Government Involvement in installing Solar System
- ◆ Bringing awareness in Rural India where there is shortage of electricity by installing Off-grid systems.

Scope

◆ PHASE II (Solar Programme)

- **Aim of Grid Connected Rooftop Solar Programme:** is to accomplish a total limit of 40,000 MW from housetop sun oriented ventures by 2022. The program will be executed with an absolute CF backing of ₹11,814 crore. The Phase II program accommodates focal monetary help (for private housetop sun based establishments) up to 40% for roof frameworks up to 3kW and 20% for those with a limit of 3-10kW. The stage II will likewise concentrate on expanding the contribution of the dissemination organizations (DISCOM).
- **Impact of Grid Connected Rooftop Solar Program:** it will have considerable ecological effect as by sparing CO2 emanations. It is said that 1.5 million units for every MW is considered as a normal vitality age and is normal that expansion of 38 GW sun oriented housetop plants under Phase-II constantly 2022 will bring about the decrease of emanation of CO2 by around 45.6 tons every year.
- It will likewise coordinate the work potential. This program will likewise create the open door for business that is up to 9.39 lakh work a long time for talented and untalented laborers.
- **Solar road Lights:** Installation of 3,00,000 quantities of sun oriented road lights all through the nation, with uncommon accentuation on territories where there is no office for road lighting frameworks through lattice control, North Eastern States and Left Wing Extremism (LWE) influenced regions.
- **Solar Power Plants:** Installation of sun oriented power plants of individual size up to 25kwp in regions where framework power has not come to or isn't dependable. Such plants are predominantly planned for giving power to schools, inns, panchayats, police headquarters, and other open administration establishments. The accumulated limit of sunlight based power plants to be introduced during the Program residency would be 100MWp.
- **Solar study lights:** giving 2500000 quantities of sun based investigation lights in north eastern states and LWE influenced locale to class going kids, up to degree of SSC, in reverse and remote territories in North Eastern states and LWE influenced regions.

Scope of the Project “CLESTA”

The project includes design, supply, installation, commissioning of the Solar PV systems of 30kW at CLESTA (Planet Godrej), Mumbai.

30kW Solar System is proposed to the client according to their requirements like:

- a) Area Available
- b) MSEB / MNRE Guidelines
- c) Project Budget
- d) Annual Average usage of electricity

The electricity generated through this PV system will be transferred to the grid by the help of Net metering, so the type of Solar PV system which will be installed is On-grid system.

- The Scope of Work will incorporate the accompanying:
- Design and supply of Solar PV System
- Detailed Planning for smooth execution of the venture
- Testing and Installation of the total framework
- Risk Liability of all faculty related with usage and acknowledgment of the venture.

Limitations

Challenges of Solar Rooftop System

- The main problem with this system is the variability in supply. As, it depends upon the solar energy that is how much bright is sunlight etc. Also, the solar panels don't produce electricity during the night because off-grid locations need more alternative sources of energy.
- Storage may be the solution but this storage technology is still underdeveloped and storage solutions are expensive.
- Maintenance of Solar Panels is very much needed throughout the year for effective generation of energy
- Maintenance includes of: -
 - (a) Cleaning of Panels once a week
 - (b) Monthly monitoring of energy generation

Company Profile

Emtronik Technology Pvt. Ltd., is a company registered under companies Act-1952 and is in the operation Since 2006. The company is managed by experienced professionals. The expertise covers the entire gamut, from planning, designing, detailed engineering, Fabrication drawings of complete range of Solar and Hydro Project equipments.

- **Roof Top solar Projects**
- **Small Hydro Power Projects**
- **Value Engineering**

The Company diversified into generation of clean and green electricity from water & sun in its own power plants as well as develops energy and infrastructure projects for other developers. The company currently has 100kW of renewable energy capacity of hydroelectric projects at various stages of development. The Company has targets to develop and own around 50 MW of new Hydro Electric Power Projects in next 5 years.

The company has successfully implemented its expertise and technology to develop energy and infrastructure projects for other developers. Company has created a niche for providing specialized hydropower solutions for small hydro as well as large hydropower plants. The services include high value engineering for hydro mechanical components and turnkey delivery.

Company made foray in solar energy projects and Joined the Government of India's ambitious SOLAR MISSION. There is enormous potential for decentralized solar energy generation for roof top of housing societies, bungalows and commercial and industrial establishments. Within short span the company has established this business too.

Company also undertakes special services of value engineering. Any savings into raw materials or process cost or administrative overheads is the direct savings or profits to the company. It is a continuous process to examine the consumption or requirements at every stage of work involved. Value Engineering is the solution to the problem. The services provided have shown a great benefit to the clientele.

The company is forward-looking and technology-driven with rich experience and expertise across all disciplines of power engineering, consulting, management and operational services.

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Literature Review

Worldwide Solar PV Market Review

In 2017, combined sun based PV limit came to right around 398 GW and produced more than 460 TW. The main nations with enormous limits in PV establishments are Australia, China, Germany, Italy, Japan, Spain, and USA. The sun oriented PV showcases in these nations are driven by solid PV venture pipelines, adaptable and imaginative financing systems, and proactive government arrangements. Real lump of sun based PV establishments in the nations, for example, Germany, Japan, and USA are on structure housetops.

Support Mechanism

The improvement of PV in a decades ago has been controlled by the arrangement of supporting strategies planned for decreasing the hole between power cost from PV and regular power sources. These plans took different structures relying upon the nearby specificities. Table 6.1 combines diverse help plans to quicken the organization of housetop Solar PV in various nations.

Table No 2: Overview of support schemes for rooftop Solar PV in selected countries

Schemes	India	USA	Germany	Japan
Direct Capital Subsidy	√	√	√	√
Green electricity schemes		√	√	
Specific green electricity scheme for PV	√			
Renewable Portfolio Standard (RPS)	√	√	√	√
Solar set aside RPS target	√	√		
Financing scheme	√	√	√	√
Tax credits/tax benefits	√	√	√	√
Net metering	√	√	√	√
Sustainable building requirements		√		√

Direct capital Subsidy: Direct capital sponsorship planned for handling the direct front cost hindrance, either for explicit hardware (PV modules) or absolute introduced PV framework cost.

Green electricity scheme: Allows clients to buy power dependent on sustainable power source from the power utility.

PV-specific green electricity: Allows clients to buy green power dependent on created PV from the power utility, typically at a top notch cost.

Renewable Portfolio Standard (RPS): A necessity that the power utility source a bit of their power supplies from sustainable power source.

Solar set aside RPS target: A necessity that a segment of the RPS be met by sun powered power supplies.

Investment funds: Share contributions in private Solar speculation assets in addition to different plans that emphasis on riches creation and business achievement utilizing PV as a vehicle to accomplish these closures.

Tax credits: Allows a few or all costs related with PV establishment to be taught from assessable pay streams.

Tax benefits :In India quickened devaluation on interest in RE gadgets (barring wind power plants) is permitted.

Net metering: The framework proprietor which devours sun powered power and gets benefits for any overabundance power nourished into the lattice, as recorded by a bi-directional power meter and acquired over the charging time frame.

Net billing: The power taken from the network and the power encouraged into the lattice is sought after independently. The power nourished into the framework is esteemed at a differ.

Sustainable building requirements: Includes prerequisites on new building improvements (private and business) where PV might be incorporated as one alternative for lessening the

structure's vitality impression or might be explicitly ordered as a consideration in the structure advancement.

National Solar PV Market Review

OFF Grid & On Grid Solar PV Applications Programme-Phase III

Project Guidelines

a) Background

- The Off-Grid & Decentralized Solar PV Applications Programme as part of the National Solar Mission is primarily focused on providing energy access solutions in the rural & remote areas.
- During Phase I & Phase II of the Programme main development such as solar lighting, solar water pumps for irrigation & drinking water facilities, solar study lamps for students.
- Decentralised Solar PV Application is being expanded in Phase II, with improved technology & cost reduction through innovative procurement mechanism.
- Under Phase III of the Programme, it is targeted to create 118 MWp equivalent solar power capacity by 31.03.2020 through Off-Grid solar PV application.

b) Scope of the Guidelines

- **Solar street Lights:** Installation of 3,00,000 numbers of solar street lights throughout the country, with special emphasis on areas where there is no facility for street lighting systems through grid power, North Eastern States & Left Wing Extremism (LWE) affected districts.

- **Solar Power Plants:** Installation of solar power plants of individual size up to 25kwp in areas where grid power has not reached or is not reliable. Such plants are mainly aimed at providing electricity to schools, hostels, panchayats, police stations, & other public service institutions. The aggregated capacity of solar power plants to be installed during the Programme tenure would be 100MWp.
- **Solar study lamps:** providing 2500000 numbers of solar study lamps in north eastern states & LWE affected districts to school going children, up to level of SSC, in backward & remote areas in North Eastern states & LWE affected districts.

c) Funding Pattern

- **Solar street lights & solar power plants:** Central Financial Assistance (CFA) for solar street lights & solar power plants will be 30% of the benchmark cost of the system or the tender cost, whichever is lower. In North Eastern States including Sikkim, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Lakshadweep & A&N islands CFA of 90% of the benchmark cost or tender cost whichever is lower, will be provided.
- **Solar Study Lamps:** For Solar study Lamps CFA of 85% of the lamp cost will be provided & balance 15% of the lamp cost will be borne by beneficiary student.
- A total of 3% of the eligible CFA will be provided as service charges to the Implementing agencies. Implementing agency will not impose any additional charges on beneficiaries and vendors for implementation of projects under this Programme.
- Benchmark costs will be revised by the Ministry from time to time depending upon market conditions.

d) Approval Mechanism

- Solar street lights & solar study lamps: Allocation for solar street lights & solar study lamps will be done by a Screening Committee, headed by Secretary, MNRE, in one go after aggregating the demand from the States/UT's.
- Solar Power Plants: Proposals for solar power plants will be sanctioned once in each quarter by the above Screening Committee.
- Proposals for new installation will only be considered by the Screening Committee. Proposals wherein the systems have already been installed under installation will not be considered for approval under the Programme by the Screening Committee.

e) Implementation Arrangements

- Programme will be implemented through State Nodal Agencies (SNAs), which will be the designated Implementation Agency under the scheme. Public sector undertakings can be implementation agencies for remote or hilly border areas for the solar power plants on the request of State Agencies.
- Executing offices will submit proposition through online gateway to MNRE for endorsement. Disconnected recommendations won't be acknowledged, except if MNRE, has given a general exclusion from the necessity of online accommodation for a particular timeframe.
- **Procurement**
 - Procurement under the Programme shall preferably be done through e-tender route.
 - **Solar street lights & solar study lamps:** In order to achieve cost-reduction through economies of scale, the procurement of solar street lights & solar study lamps will be done through centralized tender through PSU(s) designated by MNRE. The designated PSU(s) will undertake the bidding process on behalf of SNAs after aggregating the allocations

sanctioned to SNAs. Such PSU(s) will make sure that procurement of solar street light & solar study lamps should be done as per MNRE specifications & standards. For this after vendor selection vendor. After procurement of solar street lights, the same shall be installed by the vendors & the students' lamps shall be distributed by the vendors as per the details provided by respective SNAs. The vendors shall coordinate with SNAs of repair & maintenance of solar street lights & student lamps for a period of 5 years. For centralized procurement, PSUs shall be given the service charge of 0.5% out of 3% service charge being provided under this scheme.

- **Solar Power Plants:** For solar power plants, implementing agencies after submitting Detailed project report (DPR) as per prescribed format, may begin the preliminary exercises including offering process. Notwithstanding, the Letter of Award/Purchase request will be put to the chose merchants simply after the issue of authorization letter by MNRE. Further, MNRE won't be in charge of any liabilities emerging out of a circumstance where the proposition is in the end dismissed.
- **Solar study Lamps – Additional Instruction**
 - To avoid duplication, solar study lamps will be provided in blocks which have not been covered under any existing/closed scheme of MNRE. In any block has been left out totally during implementation of that scheme, such a school can also be taken up under this new scheme. Solar study lamps will be distributed by implementing agencies in close coordination with state's Education Department & any other designated agency by State Govt. Details of beneficiary students are to be provided to MNRE in the prescribed format.
 - Selected vendors shall provide sufficient tools & spares & authorized a local person in every block for maintenance & upkeep of solar study lamps. In addition, the vendor shall have one service center in each of operational district & a helpline in local language in each operational state. The components of solar study lamps shall have warranty as specified by MNRE.

- **Solar street lights – additional information**
- In case of solar street lights, the chosen merchant will be in charge of configuration, supply, installation & authorizing of sun based road light alongside 5 years upkeep. To guarantee opportune upkeep of sun powered road lights separated from preparing a neighborhood individual and making accessible vital extra parts and apparatuses in each square, the seller will have one approved administration focus in each operational region and a helpline in nearby language in each operational state. In any event 10% of the road lights authorized in a State/UT will be furnished with remote checking framework. Subtleties of the sunlight based road lights establishment are to be given to MNRE in the recommended organization.
- **Solar power plants – additional instructions**
- If there should arise an occurrence of sunlight based power plants, the chosen seller will be in charge of configuration, supply, establishment and dispatching of sun oriented road light alongside 5 years far reaching support of the arrangement. Merchants will give vital extra and devices including itemized activity and support manual and will give essential preparing to neighborhood people for activity and everyday upkeep of the plant. The merchant will have one approved administration focus in every one of the operational areas and a helpline in each operational state. All sunlight based power plants authorized under the program will be given remote observing framework. It will be required to submit quarterly support report alongside execution information of sunlight based power plant online to MNRE in arrangement recommended by MNRE. So as to guarantee opportune upkeep of sun oriented power plant, SNA's may decide on store of bank ensure by the seller.
- The implementing AGENCIES will be responsible for the following activities:
 - I. Site survey & examination of DPR to ascertain fulfillment of the eligibility conditions for CFA, before submitting the online proposals related to solar power plants to MNRE.
 - II. Demand aggregation for solar street lights & solar study lamps.

- III. Oversee installation & distribution of systems.
 - IV. Inspection of installed systems & online submission of completion reports to MNRE.
 - V. Disbursement of MNRE CFA & submission of utilization certificates & audited statement of expenditure through EAT module.
 - VI. Online submission of monthly & quarterly progress reports.
 - VII. Ensure project completion within the given timelines & compliance of MNRE Guidelines & standards.
 - VIII. Online & offline maintenance for records
 - IX. Ensure compliance of AMC & training of locals by the vendors.
 - X. Any other activity to ensure successful implementation of the programme.
- The guidelines shall be made part of bid document to ensure clarity on various provisions to the prospective bidders.

f) Project Duration

- Solar street lights & solar study lamps:
For solar street lights & solar study lamps, where the procurement is done through centralized tender, the distribution of solar study lamps & installation of solar street lights shall be completed within one year from the date of issue of LOA to the vendor by the PSU.
- Solar Power plants:
 - I. The projects related to solar power plants will be finished inside a year from the date of authorization by MNRE. Be that as it may, for North Eastern States including Sikkim, J&k, Himachal Pradesh, Uttarakhand, Lakshadweep and A&N islands this time utmost will be 15 months from the date of authorization. Augmentation in venture consummation timetables, upto a greatest time of 3 months, will be considered at level of gathering head I. MNRE and upto 6months at the degree of secretary in MNRE on accommodation of legitimate reasons by the executing

organization. Notwithstanding, such expansion will pull in decrease in administration charges to actualizing office as under:

- II. 10% reduction in applicable service charges for delay of more than one month in completion of project.
 - III. Further reduction of 20% of service charges for delay of more than two month. & up to 3 months.
 - IV. Further reduction of 20% of service charges for delay of more than three months & up to six months.
 - V. No service charges for delay in completion of more than six months.
- Work orders for the sun powered power plants will be set inside a half year from date of assent by MNRE, bombing which the administration charge to the executing office will be decreased by 10% for consistently postponement or part thereof. Aside from this MNRE, may, at its carefulness, drop the approval likewise if there should arise an occurrence of postponement past a half year in the event that it arrives at the resolution that no obvious advancement has been made after issue of assent.
 - No expansion will be conceded past a half year and just the frameworks which are introduced in all regards and authorized inside stipulated timespan will be considered for arrival of appropriation.

g) **Release of funds**

- **Solar street lights & solar power plants:** Eligible CFA including applicable service charges would be released to the implementation agency on completion of the project(s) as per terms & condition of the sanction issued by MNRE. For this purpose, the funds would be released every quarter for the projects reported to be complete at the end of the quarter, on acceptance of the project completion report in the prescribed format & other related documents by the Ministry.
- In any case, if there should be an occurrence of North Eastern States and other referenced states assets up to 25% of the benchmark cost or cost found through tenders, whichever is less, for the endorsed amount/limit would be discharged as development to the actualizing office simply after situation of letter of honors to the chose sellers. The actualizing organizations may pass on this store to the chose sellers in various stages on accomplishments of different achievements according to terms and states of letter of honors. The offset qualified CFA alongside relevant administration charges would be discharged on acknowledgment of the venture finishing report in the endorsed arrangement, Utilization authentications according to GFR and other related archives by the Ministry.
- **Solar study lamps:** Funds up to 25% of the benchmark cost or cost found through tenders, whichever is less, for the authorized amount would be discharged as development to the executing office simply after position of letter of honors to the chose merchants. The executing offices may pass on this reserve to the chose sellers in various stages on accomplishment of different achievement according to terms and states of letters of honors. The offset qualified CFA alongside material administration charges would be discharged on acknowledgment of the task consummation report in the recommended configuration, usage endorsements according to GFR and other related records by the Ministry.
- All progress & completion documents will be submitted through online portal.

h) **Monitoring**

Observing of the program and its execution will be completed during the time of usage of the Program as given underneath:

- The actualizing organization would be in charge of observing parameters, for example, end-use confirmation and assemblage of factual data.
- Implementing offices will submit month to month progress report for the endorsed ventures.
- Vendors will compulsorily give AMC to a time of 5years from the date of dispatching of the framework. AMC will incorporate accommodation of quarterly investigation report of the establishment according to recommended design.
- Funds might be discharged by actualizing organization to the merchant on accommodation of bank ensure identical to 10% of the expense of frameworks introduced by that seller for a time of two years which might be reached out on year to year premise from that point.
- The Ministry authorities or assigned organization may examine the progressing establishment or introduced plants. on the off chance that the introduced frameworks are not according to standard, non-practical by virtue of low quality of establishment, or rebelliousness of AMC, the Ministry maintains whatever authority is needed to archive the merchant. Boycotting may between alia incorporate the accompanying:
- The seller/firm won't be qualified to partake in tenders for Government upheld ventures.
- In case, the concerned Directors of the firm/organization joins another current or starts joins another organization, the organization will naturally be archived.

Technical Requirement and testing

- Frameworks introduced under this program should meet specialized determination and development guidelines as indicated by BIS and MNRE every once in a while. Resistance will be paid attention to the degree of boycotting of the seller, in a similar way as determined above, aside from making a move under some other law in power.
- Only indigenously manufactured PV modules should be used in the programme.

i) Interpretation of the Guidelines

- In case of any vagueness in understanding of any of the arrangements of these rules, the choice of the Ministry will be conclusive.

j) Review of guidelines

- The guidelines would be reviewed by an Internal Review Committee Chaired by Secretary in MNRE & modification therein would be incorporated by the Ministry.

Research Methodology

Types of Data:

- Primary Data
 - Data & information collected by survey & measurements at the site.
 - During the training session on Technical specification & Marketing
 - Information collected while visiting the Ongoing & Installed projects.
- Secondary Data
 - Major source of information from MNRE (Ministry of New & Renewable Energy) Website
 - MASMA (Maharashtra Solar Manufactures Association)

Methodology for Implementation of Grid Connected Rooftop Solar Projects in the state of Maharashtra

Table 3: The benchmark cost for the Maharashtra is as follows:

Type	Category	Benchmark Cost	Per kW 30% CFA Amount(Rs.)
Grid connected rooftop solar PV system(Rs/Wp)	Upto 10kWp	47000/-	14100/-
	>10-100kWp	44500/-	13350/-
	>100-500kWp	44000/-	13200/-

The CFA is 30% of benchmark cost or task cost whichever is less.

- Minimum Capacity of task is 1kWp and Maximum Capacity of undertaking is 500kWp for profiting CFA indigenously produced PV modules and Balance of System (BOS) according to MNRE detail and models will be took into consideration benefiting capital sponsorship.
- Sector shrewd/Category savvy qualification for profiting CFA of network associated rooftop top sunlight based power plant are as following: -

Table No:4 Open Category Applicants

Sr.No	Category	Coverage of Building	Central Financial Assistance
1	Residential	All types of residential buildings	CFA upto30% of benchmark cost or project cost whichever is minimum.
2	Institutional	School, health institutions including medical college & hospitals, universities, educational institutions etc. (including those registered under the Societies Registration Act 1860 & the Indian Trust Act 1882.)	CFA upto30% of benchmark cost or project whichever is minimum.
3	Social Sector	Community centres, welfare homes, old age homes, orphanages, common workshops for artisans or craftsman, facilities for use of community, Trust / NGOs / Voluntary organizations / Training Institutions, any other establishments for common public use etc. (including those registered under the Societies Registration Act under the societies Registration Act 1860 & the Indian Trust Act 1882)	CFA upto30% of benchmark cost or project whichever is minimum
4	Government	All types of Government Buildings	Nil
5	Industry	All types of Private Industrial	Nil

		Buildings	
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Flow Chart of Rooftop Solar Government Application Approval

Stage I

- ◆ Application to MSEDCL -Online Rs500/-
- ◆ Site verification by MSEDCL – s/o
- ◆ Site feasibility Report S/D
- ◆ Technical Sanction – E/E

Stage II

- ◆ Meter procurement- MSEDCL/Private (Secure) 1-Ph or 3-Ph
- ◆ Rs.5000/- Or Rs.10000/- Approx.
- ◆ Meter Testing (S/D) (testing) or Division Lab- Testing fee- Rs.450/-
- ◆ Approval by Division

Stage III

- ◆ Energy Purchase Agreement (EPA) as per draft of MSEDCL
- ◆ In the office of the Execution Engineer

Stage IV

- ◆ Work Completion- Site Inspection S/D
- ◆ Approval by Division
- ◆ Testing engineer inspection & NOC
- ◆ Subdivision release order
- ◆ Connection

Stage V

- ◆ Status change in MSEDCL meter reading system
- ◆ Instructions to meter reader
- ◆ Reflection into meter reading

***Time Frame- Entire Process will take 1-2 Months**

Table No:-5 Project Execution Schedule

Title	1 st Month		2 nd Month		3 rd Month	
	(In days)		(In days)		(In days)	
	1 to 15	16 to 30	1 to 15	16 to 30	1 to 15	16 to 30
Receipt of Order	_____					
Application of Government for Approval		_____				
Procurement of Material						
A- Category Material		_____	_____			
B- Category Material				_____		
C- Category Material						
Site Requirement		_____				
Supply & installation					_____	
Testing						_____

The above table gives us the idea of how much time should be taken or needed to complete a single project starting from Receipt of Order to Testing of the system after complete installation.

1. **Receipt of Order:** Confirmation of Order from Client should be received within 15 days, in includes all the documents needed for further Government approval.
2. **Application of Government for Approval:** Process is as mentioned in the above flow chart. All the necessary documents which are needed to be submitted and applying for the subsidy & Net meter.
3. **Procurement of Material:** Material is categorized in three types ABC

- i) Category-A Material: PV Panels, Foundation Material, Inverter etc.
 - ii) Category-B Material: Wires, lightningarrestor, earthing poles etc.
 - iii) Category-C Material: Nuts & Bolts, Testers, Cement if needed etc.
4. **Site Requirement:** Area should be vacant for the workers and permission from Society for continuation of work.
 5. **Supply & Installation:** Once the Foundation is built and panels should be installed properly keeping in mind the shadows, east & south direction. Installation of panels should be done in last 15 days and wires should be connected to the inverters.
 6. **Testing:** After installation of the system, testing is to be done for whole 1 week, to check energy is generated as expected or not.

The Table 6 shows the subsidy calculation for per kW available to the client after installation of Roof top PV solar system in Maharashtra. This subsidy value per Watt is revised every year according to government norms

Table No: 6 **Subsidy Calculations**

Capacity	Benchmark cost (Rs)	subsidy Rs / watt	Total subsidy (Rs)
1 To 10kW	47000	14.10	14100
10 To 100kW	44500	13.35	13350
100 To 500kW	44000	13.20	13200

**Proposal
Made for**

the Client

- | | |
|-------------------------------|--|
| 1 Name of Client | CELESTA CO-OP- HOUSING SOCIETY LTD |
| 2 Address | Old Simplex Mills Compound, Khadye Marg, |
| 3 Contact person | Mr. Ajit Kumar, Manager |
| Email id | celesta5.godrej@gmail.com |
| Type of User: | Co-op Housing Society |
| 5 Type of terrace roof /Space | RCC roof mounted |
| 6 Expected completion | immediate/ after 1 month/ 6 month |
| Management approval | Not received |

Utility	BEST		
Consumer No,	200-028-024*8		
Sanctioned	111	Kw	
Phase	3	Phase	
Terrace type	RCC		
Floors	47+G+P+WT	Nos	12 FT HT
Usable area	10 x 8	m ²	
	10 x 8	m ²	

Month	2017-18	Amount		
	Kwh	Rs		
Nov	13,854	1,59,220		
Dec	13,657	1,63,840		
Jan	14,837	1,87,840		
Feb	13,829	1,65,210		
Mar	13,426	1,45,890		
April	14,525	1,87,040		
May	7,995	1,00,693		
June	8,297	1,05,050		
July	8,099	95,760		
Aug	8,942	98,190		
Sept	8,557	1,08,521		
Oct	8,254	97,800		
Total	134272	1615054		
Average purchase price		12.03		
Avg tariff	96.07			
Proposed	30	Kw		
Space req	182	m ²		
Cost in Rs	16,33,500	Lakhs		
Subsidy Rs	4,00,500	Lakhs		
Net cost Rs	12,33,000	Lakhs		
Payback	2.8	Years		

Proposal made for the Client after calculating their requirement of electricity,

- A. **Average Annual Units:** Energy consumed throughout the year in Units.
- B. **Per day required Unit:** (Avg Annual units / Days per annum)
- C. Approximately **4 units** are generated from **1 kw** of system in a day.
- D. As their required solar capacity is very high, due to limitations in area & funds available, Proposed capacity is **30kW**.
- E. Subsidy: As being in residential sector subsidy is provided at Rs 13350 / kW.
- F. Return on Investment: Considering the total cost & subsidy available calculated ROI is 2.8 years.

Data Analysis & Interpretation

Data Classification: A solar PV system design can be done in four steps:-

- Load Estimation
- Estimation of number of PV panels
- Inverter capacity
- Cost estimation of the system



A. Load Estimation

Load estimation is done through the survey through analysis of previous year light bills, which gives us the idea of consumption of electricity for each month and average is taken for 12 months.

For Example:

Table 7 Load Estimation Calculation

Month	Pump Load		Lighting & lift load		Total	Average
	P151829		T090526		Units	Rs/Unit
	LT1B/A	RKVH	LT1B/A	RKVH		
Nov	8334	592	5520	3300	13854	11.49
Dec	8107	1112	5550	3510	13657	12.00
Jan	9047	96	5790	3630	14837	12.66
Feb	7979	783	5850	3750	13829	11.95
Mar	8116	731	5310	3450	13426	10.87
April	8675	95	5850	3540	14525	12.88
May	2415	-	5580	-	7995	12.59
June	2717	22	5580	3150	8297	12.66
July	2789	15	5310	2970	8099	11.82
Aug	3332	25	5610	3120	8942	10.98
Sept	3007	19	5550	3270	8557	12.68
Oct	2914	18	5340	3210	8254	11.85
Total	67432	3508	66840	36900	134272	12.03

Table 8 Average Calculation of Monthly consumption of Units & Electricity Bill

Month	2017-18	Amount
	Kwh	Rs
Nov	13,854	1,59,220
Dec	13,657	1,63,840
Jan	14,837	1,87,840
Feb	13,829	1,65,210
Mar	13,426	1,45,890
April	14,525	1,87,040
May	7,995	1,00,693
June	8,297	1,05,050
July	8,099	95,760
Aug	8,942	98,190
Sept	8,557	1,08,521
Oct	8,254	97,800
Total	134272	1615054
Average purchase price	12.03	

B. Estimation of number of PV panels

The estimation of number of PV panels depends on various aspects such as:

- **Efficiency of Solar PV panels**

Efficiency of the panel is calculated as ratio of capacity of the panel (KWp) with respect to the size (area) of the panel (m²), expressed as a percentage. The table illustrates the calculation for different panel capacities having the same size:

Table No: 9 Panel Efficiency

Panel's Capacity (Wp)	Panel's size (m ²)	Panel's efficiency [Wp/(1,000*m ²)]
200	1.61	12.42%
225	1.61	13.98%
250	1.61	15.53%

Note: Efficiency of a solar panels is calculated with respect to the size of the panels and therefore the efficiency percentage is relevant only to the area occupied by the panel. If two panels have the same capacity rating in (Wp), their power output is the same even if their efficiencies are different.

For Example: A 2 KW rooftop solar power plant will create a similar power yield whether it uses lower or higher proficiency boards. The zone involved by the plant with lower productivity boards will be more noteworthy than the region involved by the plant with higher effectiveness boards, however the power yield is the equivalent, Solar board proficiency (communicated as a rate) evaluates a sun oriented board's capacity to change over daylight into power. Given the comparable measure of daylight sparkling for a similar length of time on two sun oriented boards with various proficiency appraisals, the more effective board will create more power than the less productive board.

In down to earth terms, for numerous sun oriented boards of the equivalent physical size, in the event that one has a 21% proficiency rating and different has a 14% effectiveness rating, the 21% proficient board will deliver half more kWh of power under indistinguishable conditions from the 14% productive board. In this manner, in amplifying vitality use and bill investment funds is intensely dependent on having top-level sun oriented board productivity.

Most sun oriented boards are somewhere in the range of 15% and 20% effective, with exceptions on either side. Superb sunlight based boards can surpass 22% proficiency now and again (and nearly arrive at 23%!), yet most of photovoltaic boards accessible are not above 20% effectiveness.

Along these lines the boards utilized in this undertaking were of most extreme productivity, so the age of power by single board was 330 Wp.

Total panels required = $30\text{kW} / 330\text{Wp} = 91$ Panels

C. Inverter Capacity

Solar Grid Tie Inverter

Evaluated Voltage/Size : 1kw to 60kw

Our On-matrix sun based inverters are utilized to change over direct current ("DC") control created from sunlight based vitality through sun based board, into substituting current ("AC") control. It alters the voltage levels of power as indicated by the network voltage for synchronization with nearby framework supply. The On-lattice sun powered inverters feed the created capacity to the heap, and overabundance power is sent out to the matrix, encouraging Net Metering. The On-matrix sunlight based inverters are utilized for sun based on-framework extends as it were.

In this project the inverter used is of polycab, which has the capacity of converting 30kw of energy from DC to AC with least in loss of energy by 2% to 3%.



D. Cost Estimation of the Project

Keeping all the guidelines, benchmarks, CFA (Central Financial Assistance) set by MNRE of India the prices set accordingly:

Table 10 The benchmark cost for the Maharashtra is as follows:

Type	Category	Benchmark Cost	Per kW 30% CFA Amount (Rs.)
Grid connected rooftop solar PV system (Rs/Wp)	Upto 10kWp	47000/-	14100/-
	>10-100kWp	44500/-	13350/-
	>100-500kWp	44000/-	13200/-

* the cost of project may increase if sanctioned load is less than the required capacity quoted.

Fig No: 11 Financial Calculations of the Project

Project Site		CELESTA CO-OP- HOUSING SOCIETY LTD											
Location	Mumbai											Annual benefit	
Average Annual units	134272											Per day per kw output	4.00 kwh
Days (Sunshine) per annum	300											Sunshine days	300 days
Per day required Unit	447.57	Units										Capacity installation	30 KW
Expected energy per KW	4.00	Kwh/Day										Average tariff -present	12.03 Rs.unit
Required solar capacity	111.89	Kw										Annual benefit	4,33,016 Rs
Proposed capacity	30	kw											
Cost	16,33,500	Rs	50,000	per kw	GST	8.90%	4,450.00	Total	Rs per KW	54,450			
Subsidy	4,00,500	Rs	13,350	per kw									
Net Project cost	Rs 12,33,000												
Year ---->	1	2	3	4	5	6	7	8	9	10			
Net amount expense	12,33,000	7,99,984	3,66,968	-	-	-	-	-	-	-			
Annual Benefit	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016	4,33,016			
Note	The above calculations are indicative only												
Recommendations													
Cons. No.	200-028-024* 8												
Phase	3	Phase	Type	Co-op. Residential				Average existing tariff Rs	96.07 Per Unit				
Sanction load	111.00	KW											
Connected load	111.89	revised load sanction required				112.00		KW					
ROI	2.8	Years											
Remarks if any													
	Panels	330.00	Wp	91	Nos	30030	Wp						

Table No: 12 System Overview

Sr No	System Capacity of Solar PV	30kW System
1	Brand Name	Panels: Inverter:
2	Type	Roof-top On-Grid System
3	Weight & Area Required	
4	Mounting structure	Panels shall be mounted on galvanized frames inclined at 28 degrees to the south. The PV structure is designed in such a manner that module can be replaced easily and inline with site requirements and it is easy to install and service in future.
5	Energy Generation in kW/hr	4 units x 30 kw x 300days = 36000 kWh
6	Solar PV System Cost	Rs. 16,33,500 including subsidy
7	Benefits	Accelerated depreciation benefits Government Subsidies: Approx 25% of system Cost

E. Savings & Payback Period

ROI of 30kWp		Cost (Rs.)
Wp to be installed	30 kw	16,33,500
Subsidy	(Less)	4,00,500
Total		12,33,000
Annual Benefits		
1 st Year	Rs.4,33,016	7,99,984
2 nd Year	Rs.4,33,016	3,66,968
3 rd Year	Rs.4,33,016	(66,048)

Therefore the calculated ROI is 2.8 years.

Interpretation of result

- Initial installation and purchasing prices of PV systems are quite high. For CLESTA Mumbai, it will cost Rs 16,33,500 to purchase and install of a 30 kW Solar System. With such a low payback period of 2 Years 8 Months and a high lifecycle of >25 years, this project would pay for itself many times over. In this, it would be a remarkable technical and financial achievement for the society.
- The subsidies available from MNRE are valid on the benchmark capital cost set by MNRE itself according to Phase II Solar Mission.
- The annual energy requirement of the residential building is adequately met by the 30 kW system. The total energy requirement is 134742 units but due to area restriction & project cost the system will generate annually 36000 units, which will satisfy their basic needs.
- If we consider the life of the system as 25 years then the unit rate of electricity generated by this plant will be Rs. NIL per unit (After 3 years). Customer's present rate of power is Rs. 12.03/- per unit which may increase substantially in 25 years.

Findings & Observation

Advantages of solar power

- Solar energy is a very clean and renewable energy source.
- Once a solar panel is fully installed, solar energy can be produced free of charge.
- Solar energy will last for lifetime, whereas it is estimated that the world's oil reserves will last for 30 to 40 years.
- Solar energy causes no pollution. Solar cells make absolutely no noise at all.
- Very less maintenance is needed to keep solar cells running. There is very less chances of system getting damaged.
- In the long term process, there can be a high ROI due to the amount of free energy a solar panel can produce, it is estimated that the average households will see approx. 50% of their energy coming in from that solar system.

Disadvantages of Solar Power

- Solar panels can be a bit expensive to install resulting in a time-lag of many years for savings on energy bills to match initial investments.
- Electricity generation depends entirely on a country's exposure to sunlight this could be limited by a country's climate.
- Solar powered stations do not match the power output of similar sized conventional power stations; they can also be very expensive to build.
- Solar energy generated through Off-grid system is used to charge batteries so that solar powered devices can be used at night. The batteries can often be very large and heavy, taking up space and needing to be replaced from time to time.

Recommendations

This sector needs

- Standard designs
- Initial support from the legislature as far as delicate credit to balance out the market.
- Soft advances could be actualized through banks and home account organizations which have set up business forms for customer evaluation, advance security, disbursal and recuperation. This should be possible in accordance with MNRE's sunlight based water warming Program in which, MNRE is giving delicate credit at 5 percent financing cost.
- Bulk establishment of individual frameworks could help in decreasing the forthright capital expense. Delicate credit combined with institutionalized framework setups would make right economic situations for bigger off-take of rooftop top sun based PV frameworks.
- Certification of installer and engineers alongside particular preparing and accreditation of professionals for establishment of rooftop top heavenly bodies would inject trust in customers and would likewise upgrade the nature of establishments.

Conclusion

The establishment of sunlight based boards at the Residential/Institutional is monetarily achievable for the administration; because of the way that quickened deterioration and appropriation are accessible. Introducing these boards won't just diminish the expenses of customary vitality, it will likewise give numerous advantages to society and the earth. The overruling sentiment on account of natural parts of a PV exhibit is that they are basically innocuous. They produce insignificant measures of toxins which can prompt environmental change, ozone exhaustion, brown haze, or human medical issues. This sum is particularly noteworthy in contrast with conventional vitality sources, which are the main wellspring of ozone depleting substances today. From a social viewpoint, actualizing sun oriented boards on CELESTA Mumbai are possible, yet valuable. Sun powered boards would improve the Society's picture, advance ecological mindfulness, go about as an instructive apparatus, and create responsibility to the network.

Bibliography

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<http://masma.in/about-solar-energy/>

C. Maharashtra Solar Manufacturers Association:

<http://masma.in/>



www.solamiosolar.com


Certificate of Internship

We the undersigned do hereby proudly present this
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Mr. Pritam Pattnaik

For his successful completion of
Renewable Energy, Rooftop solar PV system at
M/s SOLAMIO AGRO INDIA LLP
from **1st Feb 2021** to **1st April 2021**



Solamio Agro India LLP

Designated Partner

CEO/DESIGNATED PARTNER,
M/s SOLAMIO AGRO INDIA LLP

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Mr. Rahul Nayak**, S/o- Sri Satyananda Nayak, Permanent R/o: AT-Ramachandrapur, PO-Sukarpara, PS-Nischitakoili, Odisha , has been completed successfully his EEE internship with us from 25th January 2021 to 25th February 2021 for a period of 1 month with assessment to different aspects. He displayed professional traits during his internship period and managed to complete all assigned tasks as requested.

We relieve him and thank him for being efficient and diligent in his work. It was a pleasure having him with us in this short period. We wish him all the best in his future endeavors.

Thanking You,
Yours truly,
For Pragati Milk Products Pvt. Ltd.


A handwritten signature in black ink, appearing to read "Abhiram Maharana", with a long horizontal line extending to the right towards the stamp.
Manager HR
(Abhiram Maharana)



Registered office & Processing Plant
PRAGATI MILK PRODUCTS PRIVATE LIMITED

Plot No. 71/A/1 & 71/A, New Industrial Estate, Jagatpur, Cuttack

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Ref. No.: KT/HR/INT/072

Date : 02/03/2021

This is to certify that Mr./Ms. RAJESH CHANDRA MALLIK a student of 8th Semester, B.Tech in Electrical Engineering of Raajdhani Engineering College (REC) Bhubaneswar, has successfully completed his/her Internship of 30 days during the period from 01.02.2021 to 02.03.2021.

His/ Her conduct during the training period found to be satisfactory.

We wish all the success for his/her future endeavors.

Date: 02/03/2021
Jagatpur, Cuttack-21

Bewash
Training Head

(KONARK TRANSFORMER PVT. LTD.)

