BEFORE THE HON'BLE JOINT ELECTRICITY REGULATORY COMMISSION FOR GOA AND UNION TERRITORIES
UDYOG VIHAR, PHASE-V, GURGAON

FILING NO _____
CASE NO _____

IN THE MATTER OF:

IMP Powers Limited
Silvassa, Survey No. 263/3/2/2,
Village Sayli, Umerkuin Road,
Dadra and Nagar Haveli ……..PETITIONER

AND

IN THE MATTER OF:

Electricity Department,
Dadra and Nagar Haveli …….. RESPONDENT

AND

IN THE MATTER OF:

Petition for seeking determination of Project Specific Preferential Tariff for Rooftop Solar Photo Voltaic Project of M/s IMP Powers Limited and for sale of such power to the Electricity Department of Union Territories of Dadra and Nagar Haveli under Section 61, 62, 86 and 181 of the Electricity Act, 2003 and as per the Joint Electricity Regulatory Commission for State of Goa & Union Territories (Procurement of Renewable Energy) Regulations, 2010.

PETITIONER

THROUGH

MR. C.K.RAI (ADVOCATE)
M/S. LEX WHIZ
O-55, (LGF), LAJPAT NAGAR-II
NEW DELHI 110024
PH: 011-29842827; 9910655886(M)

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AFFIDAVIT

I, Shri Ajay Dhoot , Son of Shri Ramniwas Dhoot, aged 47 years, Occupation-Business, residing at Shri Niketan, 2nd Floor, 86-A, N.S.Road, Marine Drive, Mumbai-400002 the deponent named above do hereby solemnly affirm and state on oath as under:-

1. That the deponent is the Managing Director / Director who is authorized as per the resolution of the company dated 31st December, 2011 and is acquainted with the facts deposed to below.

2. I, the deponent named above do hereby verify that the contents of the paragraph Nos. 1. of the affidavit and those of the paragraph No. _____ of the accompanying petition are true to my personal knowledge and those of the paragraph Nos. **5** and its sub-paragraphs and paragraph no. _____ of the accompanying petition are based on the perusal of records/internet data and those of the paragraph Nos. _____ to paragraph no. _____ of the accompanying petition are based on information received and those of the paragraph No. ____and paragraph no. _____ of the accompanying petition are based on the legal advice which I believe to be true and that of paragraph no. 7 is a prayer to this Hon'ble Commission. I verify that no part of this affidavit is false and nothing material has been concealed.

(Deponent)

Dated : ….12.2011

(Ajay Dhoot)

Director

IMP Powers Limited

I, C.K.Rai Advocate, working for gain at O-55, (L.G.F),Lajpat Nagar-II, New Delhi 110024 do hereby declare that the person making this affidavit is known to me through the perusal of records and I am satisfied that he is the same person alleging to be deponent himself.

(_____)

C.K.Rai

(Advocate)

Solemnly affirmed before me on this ____day of December 2011 at ___ p.m. by the deponent who has been identified by the aforesaid Advocate. I have satisfied myself by examining the deponent that he understood the contents of the affidavit which has been read over and

explained to him. He has also been explained about section 193 of Indian Penal Code that whoever intentionally gives false evidence in any of the proceedings of the Commission or fabricates evidence for purpose of being used in any of the proceedings shall be liable for punishment as per law.

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1. INTRODUCTION:

Background of IMP Powers Limited:

Established in 1961, IMP Powers Limited, hereinafter referred to as "IMP" or the "Company" or "the Petitioner" has been a global player in the electricity supply chain industry for the last five decades. Since the time of its inception IMP has synergized with the rapidly growing economy of India. With a vision to be respected and recognized as one of the leading transformer manufacturers globally through continuous innovation, IMP is a name to be reckoned with manufacturer of quality EHV, Power, Distribution, Special Purpose, Furnace, Thyristor Duty Transformers up to 200 MVA in 400 kV class. It was amongst the 1st Transformer Manufacturing Companies in India to attain ISO 9001:2000 certification in 1997. In FY 2009 – 10, the Company was awarded certification for ISO 14001:2004 for Environmental Management System Standard. In the same year, it also upgraded itself to ISO 9001:2008 from ISO 9001:2000 for Quality Management System Standard. The company has been given ISO 9001 accreditation by DNV Netherlands for its entire range of products. This certification covers designs and after sales service.

IMP is a government recognized export house. It is a professionally managed company with 11 members in Board of Directors. The Board includes Mr. Ramniwas R Dhoot, Chairman; Mr. Ajay R Dhoot, Managing Director and Mr. Aditya R Dhoot, Joint Managing Director who are also the promoters of the company. As per shareholding pattern dated 30th June 2011, Promoters and promoters group hold 49.79% in the company. Company achieved Net Sales of Rs. 249.41 Cr in FY 2010 – 11[1] as against Rs.192.90 Cr in previous year. The net profit of the company increased to Rs.7.21 Cr before extraordinary item as compared to Rs.4.59 Cr of the previous financial year. The net profit after providing for extraordinary item reduced to Rs.2.78 Cr.

IMP has two very well established State-of-the-Art Manufacturing facilities at Mumbai and Silvassa encompassing entire range of EHV, Power and Distribution Transformers, Testing Equipment and Test Benches. It has a total installed capacity of 10,000 MVA / Annum. IMP's manufacturing facility located at Silvassa, Survey No. 263/3/2/2 Village Sayli, Umerkuin Road, Dadra and Nagar Haveli (the "Silvassa Facility" or the "Project Location") is an ultra-modern plant built on a 'Green Field Site' for manufacturing HV & EHV Power

[1] Financial Year starts on 1st July and ends on 30th June

Transformers up to 400 kV Class 200 MVA. It has got extensive test facilities utilizing the highest quality test equipment.

In order to support its manufacturing facilities, fabrication unit, design center, main office, administrative buildings etc, IMP enjoys consistent availability of power from the grid throughout the year. The grid power consumption in the last FY 2010 – 11 has been detailed below:

Month	Year	Grid Power Consumption (Units)	Power Cost(Rs.)
July	2010	111,006	353,188
Aug	2010	115,980	369,079
Sep	2010	116,424	407,793
Oct	2010	113,205	360,015
Nov	2010	110,445	355,819
Dec	2010	120,544	387,666
Jan	2011	120,455	387,390
Feb	2011	85,650	279,495
Mar	2011	118,421	447,149
April	2011	101,311	556,191
May	2011	86,130	280,952
June	2011	108,965	378,004
Total		**1,308,536**	**4,562,741**

It has consumed over 13 lakh units of power this year. The total power requirement is expected to go up by 15 – 20% in the forthcoming year as IMP has a strong order book position as of now.

2. Legal Provisions:

2.1. Electricity Act, 2003

The Electricity Act, 2003 came into force from 10.6.2003.

Section 181 of the Electricity Act, 2003 confers appropriate powers to the Hon'ble State Commission to make Regulations consistent with the Electricity Act, 2003 and the rules generally to carry out the provisions of the Electricity Act, 2003 .

Section 86 (1) (e) of the Electricity Act, 2003 reads, interalia, as under:

> *"86. Functions of State Commission – (1) The State Commission shall discharge the following functions, namely:-*
>
> *(e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee."*

The above section provides that the State Electricity Regulatory Commission is mandated to promote the co-generation and generation of electricity from renewable sources by providing necessary support for connectivity to grid and specifying for purchase from renewable sources, a percentage of the total consumption of electricity in the area of distribution licensee. Thus, the Renewable Power Purchase Obligation is required to be set by the Hon'ble Commission on total consumption of the distribution licensee area.

Section 61 (h) of the Electricity Act, 2003 entrusts powers to the Hon'ble Commission to specify terms and conditions for Tariff determination of Renewable Energy projects. The relevant extract of the Act reads as follows:

> *"The Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the following, namely, the promotion of co-generation and generation of electricity from renewable sources of energy."*

2.2. National Tariff Policy

Section 3 of the Electricity Act, 2003 provides as under:

> *"3. National Electricity Policy and Plan: -(1) The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilisation of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy.*

(2) The Central Government shall publish National Electricity Policy and tariff policy from time to time.

.....

In compliance with section 3 of the Electricity Act 2003 the Central Government notified the Tariff policy in continuation of the National Electricity Policy (NEP). Para 6.4 of the Tariff Policy provides as under:

"6.4 Non-conventional sources of energy generation including Co-generation:

(1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs. ***Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the SERCs latest by April 1, 2006.***

It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. ***Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.***

(2) Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs.

(3) The ***Central Commission should lay down guidelines*** *within three months* ***for pricing non-firm power,*** *especially* ***from non–conventional sources, to be followed in cases where such procurement is not through competitive bidding.****"*

The Tariff Policy clearly bears out the context in which the function of the Commission under Section 86(1)(e) has to be exercised.

2.3. National Electricity Policy

The National Electricity Policy notified under Section 3 of the Act as a statutory policy provides as under -

"5.12 COGENERATION AND NON-CONVENTIONAL ENERGY SOURCES

5.12.1 Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, efforts need to be made to reduce the capital cost of projects based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources.

5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the share of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies.

5.12.3 Industries in which both process heat and electricity are needed are well suited for cogeneration of electricity. A significant potential for cogeneration exists in the country, particularly in the sugar industry. SERCs may promote arrangements between the co-generator and the concerned distribution licensee for purchase of surplus power from such

plants. Cogeneration system also needs to be encouraged in the overall interest of energy efficiency and also grid stability." {Emphasis added}"

2.4. The Joint Electricity Regulatory Commission for state of Goa & Union Territories (Procurement of Renewable energy) Regulations, 2010

According to the mandates given under the Electricity Act, 2003, Tariff Policy and National Electricity Policy, this Hon'ble Commission has specified Renewable Purchase Obligation under the Joint Electricity Regulatory Commission for state of Goa & Union Territories (Procurement of Renewable energy) Regulations, 2010. The relevant Regulation is quoted as under:

"1. Quantum of Renewable Purchase Obligation (RPO)

(1.1) Each distribution licensee shall purchase electricity (in kWh) from renewable energy sources, at a defined minimum percentage of the total consumption of all the consumers in its area during a year. The defined minimum percentages are given below in the Table – 1.

Minimum quantum of purchase (in %) from renewable energy sources (in kWh)

Year	*Total*	*Solar*	*Non-Solar*
2010-11	1%	0.25%	0.75%
2011-12	2%	0.30%	1.70%
2012-13	3%	0.40%	2.6%

(1.2) The RPO specified in the financial year 2012-13 shall be continued beyond 2012-13 till any revision is effected by the Commission in this regard."

It appears from the above that for the FY 2012-13 the Hon'ble Commission has specified solar RPO at 0.4% of the total consumption.

2.5. Central Electricity Regulatory Commission Renewable Energy (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulation, 2009

Under the enabling provisions of Section 61 and 178 (2) of the Electricity Act, 2003, CERC notified its Regulations on Terms and Conditions for Tariff determination from Renewable Energy Sources 2009 to prescribe the norms and procedures for tariff determination of Renewable Energy projects.

The said Regulation required the CERC to suo-motu determine the Generic Tariff for the various Renewable Energy technologies for which norms had been specified in the said Regulations. Regulation 8.1 of in this regard reads as follows:

> *"(1)The Commission shall determine the generic tariff on the basis of suo-motu petition at least six months in advance at the beginning of each year of the Control period for renewable energy technologies for which norms have been specified under the Regulations."*

The Regulation 7.1 provides for project specific tariff determination by the Commission on case to case basis, in case the developer opts for project specific tariff. Further Regulation 7.2 stipulates that the financial norms as specified in the Regulation except for capital cost shall be the ceiling norms while determining the project specific tariff.

Regulation 8.3 stipulates the following in regards to filing petition for project specific Renewable Energy Tariff determination:

> *"A petition for determination of project specific tariff shall be accompanied by such fee as may be determined by Regulations and shall be accompanied by*
>
> *a) Information in Forms 1.1, 1.2, 2.1 and 2.2 as the case may be, and as appended to these Regulations;*
>
> *b) Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan, etc.*
>
> *c) A Statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.*

d) A statement containing full details of calculation of any subsidy and incentive received, due or assumed to be due from the Central Government and/or State Government. This statement shall also include the proposed tariff calculated without consideration of the subsidy and incentive.

e) Any other information that the Commission requires the Petitioner to submit."

As mandated in the Tariff Policy, CERC Renewable Energy Tariff Regulation is a guiding for the State Commissions while framing the Renewable Energy Tariff Regulation for the State. Since this Hon'ble State Commission has not yet come out with the Renewable Energy Tariff Regulations, the Petitioner is presently submitting this petition for determination of project specific tariff determination for Rooftop Solar PV power project in accordance with the aforementioned provisions of the Act, Policies and the Regulations. The Petitioner hereby humbly requests the Hon'ble Commission to kindly consider the same.

3. The Project Details

3.1. Rooftop Based Small Solar Power Generators:

The Petitioner plans to install 6 Small Solar Power Generation Systems between 41 to 82 kW (the "Project") at the rooftops of the various buildings and sheds located within the premises of its manufacturing facility located at Silvassa, Survey No. 263/3/2/2 Village Sayli, Umerkuin Road, Dadra and Nagar Haveli (the "Silvassa Facility" or the "Project Location"). These small systems are labeled as Solar System ("SS") 1 to 6 and collectively referred to as the "Project" in the remainder of the document. The details of the rooftop area available and the proposed installation are as indicated below:

Sl. No.	Building	Solar System	Area (Sq. meter)	Installation Size[2] (kW)	Solaroof-256(Nos.)	Solaroof-128(Nos.)
1	Existing Main Shed	1	2,223	82	320	0

[2] Based on preliminary study, on an average 20 – 23 sq. meter of rooftop area is required for 1 kW installation. The capacity of installation will be firmed up during detailed engineering stage.

2	Existing Other Shed	2	1,325	48	186	0
3	New Shed I	3	1,086	41	117	87
4	New Shed II	4	1,892	74	204	174
5	New Shed III + Workshop	5	1,212	43	124	87
6	SOT Blasting & other buildings	6	1,400	59	0	460
	Grand Total		**9,138**	**347**	**951**	**808**

This Project will be capable of producing an average annual output of about 4.86 Lakh units of peak electricity at the Project Location. Monthly output would range between 30,000 kWh to 80,000 kWh.

3.2. The EPC Contractor

IMP has appointed M/s Sumer Energy Private Limited ("SEPL") to deliver a complete and fully operational roof top solar PV system on a lump sum turnkey basis.

SEPL's Scope of Work primarily includes complete EPC works – conceptualization, designing, engineering, supplying, installing, testing and commissioning the systems and project management as part of the solar PV rooftop installation project. The detailed break-up of the activities are as below:

i) Detailed analysis of the factors at site such as insolation, roof facing direction, tilt and shading conditions that determines the yield of rooftop based solar PV panels.

ii) Roof structural analysis before project implementation.

iii) Coordination of roof work with contractors who are certified in the installation of the existing roofing systems

iv) Investigation and confirmation whether the solar installation will cause any disturbance to the existing structure, and if any special permitting is needed.

v) Required Design / Engineering drawings including PV system layout on the roof and mounting details, Balance of system which includes interconnecting wiring, conduit, inverters, transformers, cables, metering systems and water sprinkler along withwater treatment systems.

vi) Complete familiarity with all field / site conditions as it pertains to this work. Our client is encouraged to make suggestions that may enhance the rooftop design or reduce overall effort/costs.

vii) Supply of panels mounted into pre-engineered unit along with all the required materials (BoP) for the complete and successful installation of roof top solar panels such as inverters, cables, junction boxes, lightening arrestors, cleaning systems, special tools etc.; testing, installation and commissioning of the power system

viii) Operations and maintenance of the solar power generation system under a separate O & M contract that could be signed between the two parties at a subsequent point in time.

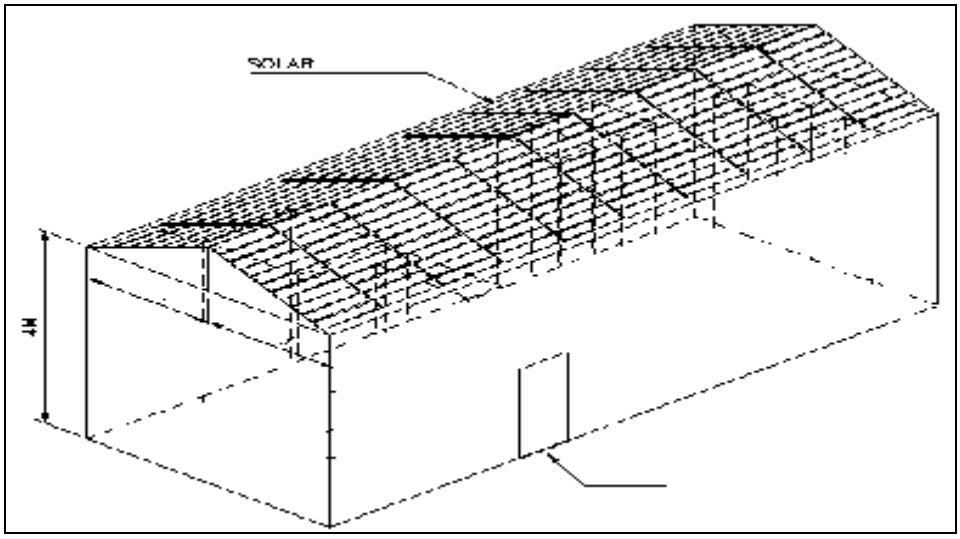
All work performed by SEPL shall conform to all state and local municipal codes and standards.

3.3. Project Execution Methodology

SEPL's integrated rooftop product, ***Solaroof***, combines the solar panels and mounting system into a single, pre-engineered unit and thus does away with the need to use glass frame. The unit comprises of strong corrugated Galvalume metal sheet and Galvalume plate of requisite thickness in lieu of glass. The thin film solar PV panels are laminated onto the Galvalume sheets through back-sheet, with individual thickness of 3 mm that is made of industrial glue and directly sticks to all surfaces. The back-sheet adds to the strength and flexibility of panel as well as providing a thermal insulation to the roof. The Galvalume roofs are designed and manufactured in-house at our works. Once the roof mount structure is assembled on roofs, the solar panels will be stuck on the roof with the help of a strong industrial adhesive that comes with the solar panel.

Solaroof Product Details	
Watt per sheet (2x64W / 2x128W)	128 / 256
Energy Yield per sheet per annum (kWh)	205 / 410
Weight (kg/Sq.Meter)	8.5
Area of sheet (Sq.Meter)	5.8 (5.8Mx1M)
Thickness (Panel + Galvalume sheets) (mm)	4.8 – 5.1

A sample plan drawing of roof with solar panel installation is proposed as follows:



3.4. Technical Details of the Solar System

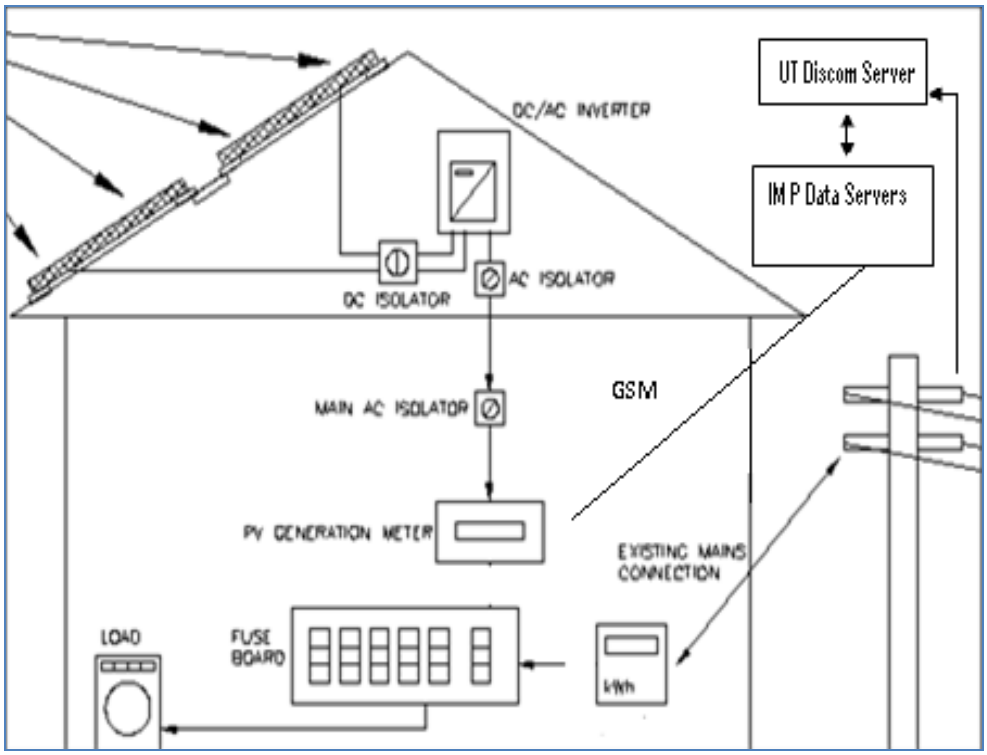
The material underlying SEPL's product Solaroof is amorphous silicon (a-Si) based thin-film solar laminates manufactured by United Solar Ovonics ("Uni-solar®"), a subsidiary of Energy Conversion Devices of Michigan, USA. The solar panels are mounted on corrugated Galvalume sheets. The PV laminates are manufactured in standard dimensions of 5.5 m x 0.394 m x 4 mm with steel substrate and are mounted onto the Galvalume roof with bolts and clips. The laminate comes with a potted terminal housing assembly with output cables, quick-connect terminals on top and an adhesive back-sheet. The roof sheets would be customized to suit the area and structure.

Wires from the individual panels are drawn into a conduit over the roof that brings DC power in to a specially designed panel box that contains an AC converter and synchronizes the power with the grid at desired voltage. The solar system will be interconnected with the existing electrical systems and substation at the client's location.

The electrical systems and other civil/structural items include:

- Thin-Film Solar PV Modules
- Galvalume / CGI Single / Double layered roofs
- Inverters and Junction Boxes

- Automated cleaning systems and water treatment/storage plant (optional)
- Wiring, DC Distribution Boards, Cables, switchyards
- Metering and GSM Modems (optional)
- Control panels, Instrumentation and data servers
- Earthing and Lightning systems (if required)



Installation of water treatment plant along with automated water sprinklers is an integral part of the proposed roof structure for cleaning and maintenance of panels for maximizing the output.

3.5. Rooftop Solar System Architecture

The yield difference of rooftop PV panels will depend on factors like insolation, roof facing direction, tilt, and shading conditions that exist at project site. A detailed analysis of these factors would be undertaken for project development. A 6-10°tilt can be achieved to generate the maximum energy output. It is observed that the building orientation in North-South direction is most favorable for better power output as compared to an East-West facing structure due to longer and direct exposure to sunlight during the day.

3.6. Benefits of the Uni-solar® Thin-Film Technology

Uni-solar® amorphous silicon (a-Si) based thin-film solar laminates is flexible PV systems that are best suited for Building Integrated PV (BIPV) and rooftop solar solutions. The a-Si thin-film PV technology is durable, lightweight, glass-free, waterproof and more flexible compared to the conventional crystalline silicon PV and Concentrator PV methods of solar power generation. The thin film production process is faster and involves usage of less than 1% of expensive raw material leading to lower cost per Watt peak for raw materials, lower energy consumed and thus a significant advantage to the end consumer.

Thin-film solar technology is efficient even in hazy, diffuse or overcast weather conditions due to their unique triple-junction solar cells, which absorb the blue, green and red light spectrum of the sun in different layers of the cell. The thin-film is shadow tolerant and delivers in partial shade/soil and cloud cover due to by-pass diodes connected across each cell with an output loss of less than 4.5% per shaded/soiled cell. Uni-solar® panels require little maintenance, do not pollute, and operate silently, making the photovoltaic energy a very clean, green and safe method of power generation. Also, owing to suitability for rooftop installations there are lesser connection issues and security problems.

Other benefits include improved thermal insulation and minimum penetration on roof.

3.7. Infrastructural Set-up Advantages

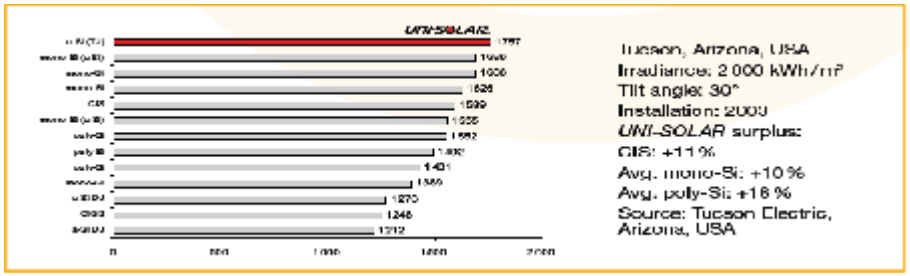
i) **Fewer parts**: Thin-film laminates could be adhered directly to roofing materials without the need of a tracking system. This translates directly into material and labor cost savings resulting in a cost benefit of $ 0.35 – $0.90/Wp. In addition, the lower voltage of the laminates, compared to other thin-film products, permits a greater number of laminates per string. Wiring, components and labor for interconnections are reduced further lowering the balance-of-system costs.

ii) **No structural roof reinforcements**: The PV laminates weigh only about 0.34kg/sq ft. Conventional glass modules add about 1.5 – 2 kg/sq ft. of distributed weight to a roof and are typically installed on racks, which create higher point loads and increased wind loading. The

combined weight and wind load of these competitive systems add risk to the building envelope and might require costly structural roof reinforcements.

iii) **Extreme weather resistance and easy maintenance**: Solar roofing systems using this technology have achieved best wind ratings > 298 km/hr in test conditions in USA. Glass-free modules ensure there is no breakage due to hail winds or other debris that is common to tropical nations. There is no racking system to trap debris and cause maintenance issues.

iv) **Energy conversion efficiency Vs Average Electricity output:** Uni-solar® laminates have been observed on the basis of real test conditions to produce similar or better energy output than the mono and polycrystalline cells. This is demonstrated through the example of the third party testing conducted in Tucson, Arizona, USA. In Tucson, Uni-solar® standard laminate size of surface area 5.5 m x 0.4 m produces about 1,757 units per kW installed. A poly Si crystalline module with standard surface area of 1.6m x 1.06m is seen to produce 1,552 units per installed kW. This is proven that Uni-solar® thin-film laminates require similar roof areas to produce the same amount of energy as crystalline panels. Also, Uni-solar®'s unique triple junction technology improves the throughput to a level that number of electricity units produced at a given area is more than the conventional PV panels. This would be evident from the chart of Tucson Electric Arizona – Annual Average yield in kWh (2004-2007) below:



v) **Guarantees:** There is power output guarantee of 92% for 10 years, 85% for 15 years, and 80% for 25 years. The Solar panels come with a 5 Year limited product warranty from manufacturer.

3.8. Project Implementation Schedule

The implementation schedule can be broadly shown in four stages:

- Project Development,
- Finalization of supply of Equipment and sub-contracts,
- Procurement and Construction,
- Plant Commissioning

The proposed time schedule for the implementation of project is 4 – 6 months, which includes 1 month for procurement of systems, shipment and receipt and 3 months for design, engineering, construction, installation, final testing and commissioning. The most optimistic project schedule is shown as below:

No	Activity	Month 1	Month 2	Month 3	Month 4
1	Confirmation of project	√			
2	Advance payment to SEPL by the client	√			
3	Application engineering, Detailed roof assessment and initiation of roof recalculations	√			
4	Solar PV and Balance of Systems procurement	√	√		
5	Rooftop design and construction		√	√	
6	Construction and deployment of integrated system			√	
7	Complete installation, testing and commissioning				√

4. Advantages of promoting Distributed Power Generation Projects based on Rooftop Solar PV

Supporting Distributed Power Generation Projects based on Rooftop Solar PV would be a good long term strategy for India in view of the considerable benefits that will accrue, viz.,

i) Energy security, through optimal utilization of locally available bio resources.

ii) Tail end generation will provide grid stability, stable voltage and reduce the need for enhancing the capacity of T&D networks to meet growing electricity consumption needs.

iii) Small plants of around few kW to 1-2 MW help in improving the voltage of the 400Volt /11 KV Grid.

iv) They help in improving the power factor. This is crucial as usually when irrigation pumps are connected the power factor deteriorates.

v) Grid frequency stabilises

vi) They limit T&D losses to a large extent.

5. Preferential Tariff/ Feed-in Tariff for Rooftop Based Small Solar PV Power Projects: International Experience

Considering the above referred benefits, many European countries as well as the various States of the USA are currently giving the higher preferential tariff for rooftop and BIPV projects as against the ground mounted projects. Feed-in Tariff for UK and Germany are shown as below:

5.1. German feed-in tariff for photovoltaic installations for 2012

Depending on the type of installations, the 2012 PV feed-in tariffs for newly installed systems will therefore range from 18.33 ct/kWh to 24.43 ct/kWh.

Roof-mounted facilities (§ 33 EEG)	Euro ct/kWh
Capacity	
Up to 30 kW	24.43
Up to 100 kW	23.23
Up to 1 MW	21.98
Over 1 MW	18.33

If generated electricity is consumed within immediate vicinity of building/facility by operator or third parties for installations up to 500 kW: Payment of feed-in tariffs for consumed electricity, but the applicable feed-in tariffs will be reduced by EUR 0.1638 for up to 30 percent of the generated power and by EUR 0.12 for the remaining power

5.2. UK feed-in tariff for photovoltaic installations for 2011

As of 1st April 2011 the UK Feed-in Tariff rates increased 4.8% in line with the retail price index.

Adjusted Solar PV Feed-in Tariff rates: 1 April 2011 - 31 March 2012

Solar PV System size	Old Feed-in tariff (pence/kWh)	Updated Feed-in tariff (pence/kWh)
≤4 kW new build	36.1	37.8
≤4 kW retrofit	41.3	43.3
>4-10kW	36.1	37.8

Source: Ofgem

6. Computation of Preferential Levelized Tariff:

6.1 The Project Cost

The Project is expected to incur a total capital expenditure of Rs. 545 Lakhs on account of Solar System:

Sl. No.	Component	Unit	SS – 1	SS – 2	SS – 3	SS – 4	SS – 5	SS – 6	Total
1	Installation Size	kW	82	48	41	74	43	59	347
2	Solar System Cost	Rs. Lakh	129	75	64	117	67	92	545

The tentative break-up of the Solar System Cost is detailed below:

Sl.	Parameter	Unit	SS – 1	SS – 2	SS – 3	SS – 4	SS – 5	SS – 6	Total
1	Installation Size	kW	82	48	41	74	43	59	347
2	P V Modules	Rs. Lakh	73	43	37	67	38	53	311
3	Civil & General Works	Rs. Lakh	7	4	4	6	4	5	30
4	Mounting Structures & Water Proofing	Rs. Lakh	10	6	5	9	5	7	43
5	Power Conditioning Unit (Inverters and associated electronics, Lightening arrestors &	Rs. Lakh	16	9	8	15	8	12	68

	protection devices, Earthing system, IT & Communication)								
6	Evacuation Cost up to Inter-connection Point (Cables, Junction boxes, Metering and other accessories)	Rs. Lakh	7	4	4	6	4	5	30
7	Sprinkler System with Piping and Pump[3]	Rs. Lakh	10	6	5	9	5	7	42
8	Water Treatment Plant[3]	Rs. Lakh	5	3	2	5	3	4	21
9	**Total Capital Expenditure**	Rs. Lakh	**129**	**75**	**64**	**117**	**67**	**92**	**545**

For 1 MW project's cost prorated from IMP's Project Cost is presented below:

Sl. No.	Parameter	Unit	Prorated from IMP's Project Cost
1	Project Size	MW	1.00
2	P V Modules	Rs. Cr	8.97
A	Import Price	$ / Watt	1.83
B	Exchange Rate	INR / $	49.00
C	Degradation Cost	Rs. Cr	-
3	Land Cost	Rs. Cr	-
4	Civil & General Works	Rs. Cr	0.86
5	Mounting Structures	Rs. Cr	1.24
6	Power Conditioning Unit	Rs. Cr	1.95
7	(Inverters and associated electronics, Lightening arrestors & protection devices, Earthing system, IT & Communication)	Rs. Cr	0.86
8	Preliminary and Pre-Operative Expenses including IDC and contingency	Rs. Cr	-
9	Sprinkler Systems, Piping and Pump	Rs. Cr	1.21
10	Water Treatment Plant	Rs. Cr	0.61
11	**Total Capital Expenditure**	**Rs. Cr**	**15.70**

[3]The Project will have an integrated Sprinkler System with Piping & Pump and Water Treatment Plant for all the 6 SS. The costs of these integrated facilities have been split across the 6 SS in proportion of their installation size

It may be mentioned that higher capital cost compared to ground mounted solar power project is due to the cost of the sprinkler systems, piping & pump, water treatment plant that form an integral part of such rooftop based solar power generators as the panels need regular and automated cleaning to function optimally. Other factors are economy of scale and the higher benchmark exchange rate and import price of the solar PV panels.

6.2. Tariff Design

Regulation 9.1 of the CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009 stipulates that the tariff for renewable energy technologies shall be single part tariff consisting of the following fixed cost components:

A. Return on Equity Capital;
B. Interest on loan capital;
C. Depreciation;
D. Interest on Working Capital;
E. Operation and maintenance expenses;

The CERC Renewable Energy Tariff Regulation, 2009 has defined the Tariff Period for Solar rooftop PV projects as twenty five (25) years.

6.3. Tariff Components

All the cost components used for determination of the levelized tariff for the Project have derived their basis from CERC's signed order no. 256 / 2010 (suo motu) dated 9th November 2010. CERC in this order has laid down the operating model assumptions and preferential tariff for solar projects where PPA will be signed after 31st March 2011 and commissioned in FY 2011 – 12. The assumptions behind the operating model of the Project (prorated for 1 MW) are detailed below:

Sl. No.	Assump-tion Head	Sub-Head	Sub-Head (2)	Unit	Project Assumptions
1	**Power Generati-on**	**Capacity**	**Installed Power Generation Capacity**	**MW**	**1**
			Capacity Utilization Factor	%	16.0%
			Annual Deration (after 2 years)	%	0.5%
			Useful Life	Years	25
			Gross generation	MU	1.40
2	**Project Cost**	**Capital Cost**	**Power Plant Cost**	**Rs. Lakhs**	**1,570**
			Tariff Period	Years	25
		D : E	Debt	%	70%
			Equity	%	30%
			Debt	Rs Lakhs	**1,099**
			Equity	Rs Lakhs	**471**
		Debt Component			
			Loan Amount		**1,099**
			Moratorium Period	Months	0
			Repayment Period(incl. Moratorium	Years	10
			Interest Rate		13.25%
		Equity Component			
			Equity amount	Rs Lakh	**471**
			Return on Equity for first 10 years	% p.a	19%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	24%
			Weighted average of ROE		22%

Sl. No.	Assump-tion Head	Sub-Head	Sub-Head (2)	Unit	Project Assumptions
			Discount Rate		15.88%
		Fiscal Assumptions			
			Income Tax		33.22%
			MAT Rate (for first 10 years)		19.93%
			80 IA benefits	Yes/No	YES
		Depreciation			
			Dep. Rate for first 10 years		7.00%
			Dep. Rate 11th year onwards		1.33%
			Years for 7% rate		10
			Dep. as per Companies Act		5.28%
			Dep. as per IT Act		80%
			Dep. as per IT Act @ pro rata in the 1st year		40%
	Working Capital				
			O&M Charges	Months	1
			Maintenance Spare (of O & M Expenses)	%	15%
			Receivables for Debtors (actual Fixed cost)	Months	2
			Interest On Working Capital	%	12.75%
	Operation & Maintenance				
			O & M Expenses per annum	Rs Lakh	10.06
			O & M Expenses Escalation	%	5.72%

6.4. Rationale for assumptions in Capacity Utilization Factor (CUF)

CERC in its signed order no. 256 / 2010 (suo motu) dated 9th November 2010 and in its Regulation 58 of the CERC (Terms and Conditions for determination of Tariff from Renewable Energy) Regulations, 2009, has specified the CUF of 19% for determination of Tariff for Solar PV power projects.

GERC in its Discussion Paper on "Determination of tariff for procurement of power by distribution licensees and others from solar energy projects for the State of Gujarat" proposed annual degradation in the performance at 1% for determination of tariff. The relevant para is reproduced as under:

> ***".2.3.5 Annual Degradation in Performance***
>
> *A performance warranty for 25 years on photovoltaic modules is an industry standard today. Typical warranties guarantee a performance of more than 90% for the first 10 years, and a performance of more than 80% for the next 15 years, adding to a total of 25 years. This implies an annual degradation rate of 0.9% for the photovoltaic modules.*
>
> *No substantial degradation is expected in the performance of the balance of system.*
>
> ***Hence, the acceptable annual degradation in the performance of the grid-connected photovoltaic system is 1%"***

The Petitioner has however considered a CUF of 16%with an annual degradation factor of 0.5% after first year of operations in its Tariff calculations.

The Petitioner would like to humbly submit to the Honorable Commission that the yield difference of Uni-solar rooftop PV system with respect to ground mount systems is owing to few variations like insolation and temperature on account of tilt, and shading conditions that are witnessed across the two applications. In a ground mount structure, the ideal tilt of 15-20° can be achieved to generate the maximum energy output. However, in case of the existing rooftop, solar installation is oriented as per the existing rooftop configuration. Hence, the ideal elevation and angle cannot be achieved for maximum output.

Moreover, it is observed that the buildings oriented towards true south or North-South direction are most favorable for better yield as compared to an East West facing structure due to longer and direct exposure to sunlight during the day. Hence a lower capacity utilization factor (CUF), of around 16% has been considered. The reason for the same is explained subsequently.

The solar irradiation and surface meteorology data for the Project Location Silvassa is summarized below (Refer Annexure – II for solar data for Silvassa, India):

Sl.	Month	Monthly Averaged InsolationIncident On A Horizontal Surface[4] (kWh / m² / day)	Monthly Averaged InsolationClearness Index[5] (0 – 1)
1	Jan	5.37	0.72
2	Feb	6.29	0.73
3	Mar	7.08	0.73
4	Apr	7.46	0.70
5	May	7.47	0.68
6	Jun	6.17	0.55
7	Jul	5.31	0.48
8	Aug	5.34	0.50
9	Sep	6.02	0.60
10	Oct	5.95	0.67
11	Nov	5.39	0.70
12	Dec	5.03	0.70
13	**Average**	**6.06**	**0.65**

The CUF has been calculated as below:

Sl. No.	Particular	Unit	Value
1.	Average Insolation (A)	kWh / m² / day	6.06
2.	Days in a year (B)	Nos.	365

[4 & 5] 22 year average data; refer solar data of Silvassa in Annexure – II

3.	Yearly insolation (C) = (A) x (B)	kWh / m²	2,212
4.	Average Clearness (D)		0.65
5.	Total hours in a year (E)	hours	8760
5.	CUF (F) = (C) * (D) ÷ (E)	%	16.41%

6.5. Levelized Tariff

Based on the capital cost of the Project and the assumptions detailed in the section preceding this, the Project is eligible to seek a levelized preferential tariff of Rs. 20.25 per unit without accelerated depreciation benefits and Rs. 17.08 per unit with accelerated depreciation benefits for the entire duration of the PPA (Refer Annexure – III for detail working of the preferential tariff). The levelized preferential tariff structures as per assumptions turn out to be as detailed below:

Sl. No.	Parameter	Unit	Project Model
1.	PPA Tariff	Rs / unit	20.25
2.	Accelerated Depreciation Benefit	Rs / unit	3.17
3.	PPA Tariff Net of Accelerated Depreciation benefit	Rs / unit	17.08
4.	No. of years	Years	25

This Project will be capable of producing an average annual output of about 4.86 Lakh units of peak electricity at the Project Location. Monthly output would range between 30,000 kWh to 80,000 kWh.

Sharing of CDM Benefits

All risks, costs and efforts associated with the availing of carbon credits shall be borne by the Petitioner. Further, the entire proceeds of carbon credit from approved CDM project, if any, shall be retained by the Petitioner.

7. Prayer to the Hon'ble Commission

In this premise, the Petitioner respectfully prays that the Honorable Commission may be pleased to:

i) Approve the proposed project specific tariff of Rs. 20.25 per unit without accelerated depreciation benefits and Rs. 17.08 per unit with accelerated depreciation benefits for the entire duration of the PPA for the power to be fed in to the grid;

ii) Approve and allow all power generated from the proposed 347 kWp system to be fed in to the grid and paid for by the Distribution Company of the Dadra & Nagar Haveli at the approved project specific tariff rate as per point (A) above under the solar RPO obligation.

iii) Issue appropriate instructions to the Distribution Company for connection to the grid at 400 Volts at 6 or more places.

iv) Condone any inadvertent omissions, errors, short comings and permit the petitioner to add/ change/ modify/ alter this filing and make further submissions as may be required at a future date; and

v) Pass such other and further orders as are deemed fit and proper in the facts and circumstances of the case.

vi) Direct distribution companies in the state to take appropriate step to facilitate roof top feed-in tariff

PETITIONER

THROUGH

MR. C.K.RAI (ADVOCATE)
M/S. LEX WHIZ
O-55, (LGF), LAJPAT NAGAR-II
NEW DELHI 110024
PH: 011-29842827; 9910655886(M)

//ANNEXURE-I//

DETAILED PROJECT REPORT

Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan, etc

{KINDLY SEE SEPARATE ATTACHMENTS FOR ANNEXURE-I}

//ANNEXURE-II//

SOLAR DATA FOR SILVASSA, INDIA

The data used in this section has been retrieved mostly from http://www.gaisma.com/en/location/silvassa.html on the day of writing this report. The basic information of Silvassa is summarized below:

Sl. No.	Parameter	Remark
1.	Latitude	+20.27 (20°16'12"N)
2.	Longitude	+73.01 (73°00'36"E)
3.	Time Zone	UTC +5:30 hours
4.	Country	India
5.	Continent	Asia
6.	Sub-region	Southern Asia
7.	Distance from Mumbai	150 kms
8.	Altitude	40 m

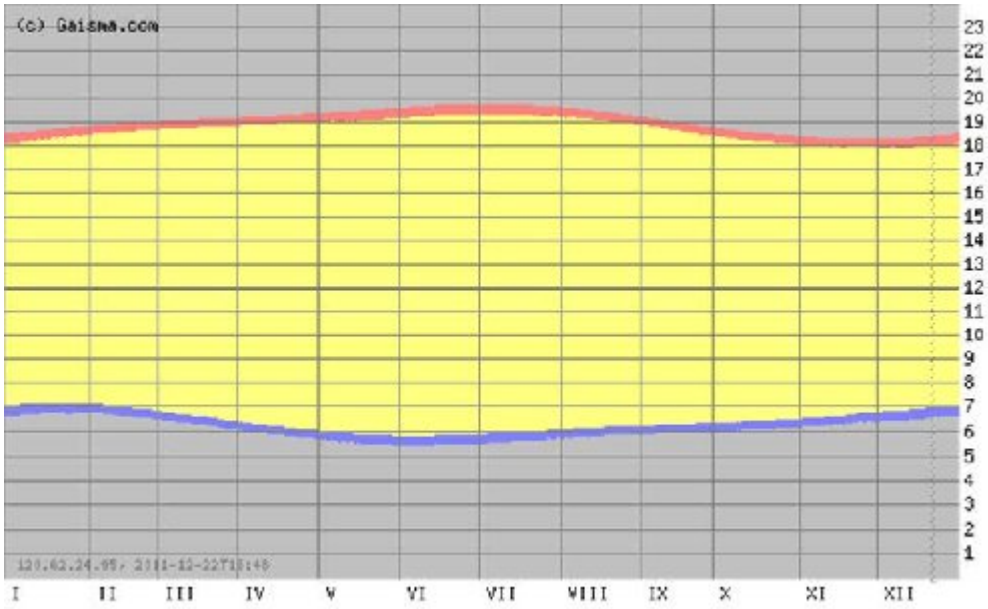
The solar energy and surface meteorology data for Silvassa has been summarized below:

Variable	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Insolation, (kWh/m²/day)	4.69	5.48	6.24	6.81	6.74	5.22	4.03	3.88	4.67	5.29	4.86	4.41
Clearness (0 – 1)	0.63	0.65	0.65	0.65	0.62	0.48	0.37	0.37	0.47	0.60	0.63	0.62
Temperature (°C)	23.57	25.01	28.39	29.55	28.89	26.75	25.28	24.72	25.17	27.01	26.00	23.89
Wind speed (m/s)	2.84	3.18	3.39	3.82	4.32	4.43	4.52	4.00	2.91	2.39	2.35	2.54
Precipitation (mm)	0	0	1	1	8	343	876	604	339	64	10	2
Wet days (d)	0.0	0.0	0.0	0.0	0.4	8.8	17.7	16.6	8.5	1.8	1.1	0.2

SILVASSA, INDIA - SUNRISE, SUNSET, DAWN AND DUSK TIMES, TABLE

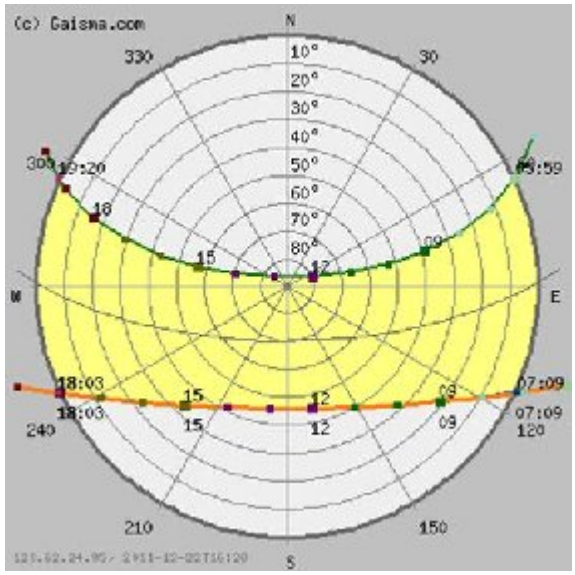
Date	Sunrise	Sunset	Length	Change	Dawn	Dusk	Length	Change
Today	07:09	18:03	10:54		06:45	18:28	11:43	
+1 day	07:10	18:04	10:54	equal length	06:46	18:28	11:42	00:01 shorter
+1 week	07:12	18:07	10:55	00:01 longer	06:48	18:31	11:43	00:00 longer
+2 weeks	07:15	18:12	10:57	00:03 longer	06:51	18:36	11:45	00:02 longer
+1 month	07:16	18:22	11:06	00:12 longer	06:53	18:46	11:53	00:10 longer
+2 months	07:05	18:39	11:34	00:40 longer	06:43	19:01	12:18	00:35 longer
+3 months	06:41	18:49	12:08	01:14 longer	06:19	19:11	12:52	01:09 longer
+6 months	05:59	19:21	13:22	02:28 longer	05:34	19:45	14:11	02:28 longer

SILVASSA, INDIA - SUNRISE, SUNSET, DAWN AND DUSK TIMES, GRAPH



Legend: Darkness Dawn Sunshine Dusk

SILVASSA, INDIA - SUN PATH DIAGRAM



Sun path
- Today
- June 21
- December 21
- Annual variation
- Equinox (March and September)

Sunrise/sunset
- Sunrise
- Sunset

Time
- 00-02
- 03-05
- 06-08
- 09-11
- 12-14
- 15-17
- 18-20
- 21-23

MONTHLY AVERAGED INSOLATION INCIDENT ON A HORIZONTAL SURFACE (kWh/m2/day)

Lat 20.267 Lon 70.017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
22-year Average	5.37	6.29	7.08	7.46	7.47	6.17	5.31	5.34	6.02	5.95	5.39	5.03	6.06

MONTHLY AVERAGED DIFFUSE RADIATION INCIDENT ON A HORIZONTAL SURFACE (kWh/m2/day)

Lat 20.267 Lon 70.017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
22-year Average	0.81	0.91	1.18	1.53	1.80	2.28	2.42	2.29	1.81	1.28	0.95	0.81	1.51
Minimum	0.72	0.78	1.01	1.36	1.66	2.08	2.28	2.16	1.64	1.12	0.84	0.72	1.37
Maximum	0.98	1.19	1.42	1.74	2.06	2.41	2.44	2.34	2.03	1.53	1.05	0.99	1.68
22-year Average K	0.72	0.73	0.73	0.70	0.68	0.55	0.48	0.50	0.60	0.67	0.70	0.70	0.65
Minimum K	0.67	0.67	0.68	0.66	0.62	0.49	0.40	0.44	0.52	0.60	0.67	0.65	0.59
Maximum K	0.74	0.76	0.76	0.73	0.70	0.62	0.56	0.56	0.65	0.71	0.72	0.73	0.68

NOTE:	*Diffuse radiation, direct normal radiation and tilted surface radiation are not calculated when the clearness index (K) is below 0.3 or above 0.8.*

//ANNEXURE-III//

DETAILED WORKING OF THE PREFERENTIAL TARIFF

Assumpion for Solar PV Power Projects Parameters

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Asumptions
1	**Power Generation**				
		Capacity			
			Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	16.0%
			Deration Factor	%	0.5%
			Useful Life	Years	25
2	**Project Cost**				
		Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	1570
3	**Financial Assumptions**				
			Tariff Period	Years	25
		Debt: Equity			
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	1099.00
			Total Equity Amout	Rs Lacs	471.00
		Debt Component			
			Loan Amount	Rs Lacs	1099.00
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	10
			Interest Rate	%	13.25%
		Equity Component			
			Equity amount	Rs Lacs	471.00
			Return on Equity for first 10 years	% p.a	19.00%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	24.00%
			Weighted average of ROE		22.00%
			Discount Rate		15.88%
4	**Financial Assumptions**				
		Fiscal Assumptions			
			Income Tax	%	33.220%
			MAT Rate (for first 10 years)	%	19.930%
			80 IA benefits	Yes/No	Yes
		Depreciation			
			Depreciation Rate for first 10 years	%	7.00%
			Depreciation Rate 13th year onwards	%	1.33%
			Years for 7% rate		10
5	**Working Capital**				
		For Fixed Charges			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		For Variable Charges			
		Interest On Working Capital		%	12.75%
6	**Operation & Maintenance**				
		power plant (FY 11-12)			10.06
		Total O & M Expenses Escalation		%	5.72%

ANNEXURE -IV

Determination of Tariff for Solar PV

Units Generation	Unit	Year--->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Generation	MU		1.40	1.39	1.39	1.38	1.37	1.37	1.36	1.35	1.35	1.34	1.33	1.33	1.32	1.31	1.31	1.30	1.29	1.29	1.28	1.27	1.27	1.26	1.26	1.25	1.24

Fixed Cost	Unit	Year--->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		10.06	10.64	11.24	11.89	12.57	13.29	14.05	14.85	15.70	16.60	17.55	18.55	19.61	20.73	21.92	23.17	24.50	25.90	27.38	28.95	30.60	32.35	34.20	36.16	38.23
Depreciation	Rs Lakh		109.90	109.90	109.90	109.90	109.90	109.90	109.90	109.90	109.90	109.90	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93	20.93
Interest on term loan	Rs Lakh		138.34	123.77	109.21	94.65	80.09	65.53	50.97	36.40	21.84	7.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capit	Rs Lakh		7.86	7.57	7.29	7.00	6.72	6.44	6.17	5.89	5.62	5.35	3.82	3.88	3.93	3.99	4.05	4.12	4.19	4.26	4.34	4.42	4.50	4.59	4.69	4.79	4.90
Return on Equity	Rs Lakh		89.49	89.49	89.49	89.49	89.49	89.49	89.49	89.49	89.49	89.49	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04	113.04
Total Fixed Cost	**Rs Lakh**		**355.64**	**341.37**	**327.13**	**312.93**	**298.77**	**284.65**	**270.57**	**256.54**	**242.55**	**228.62**	**155.34**	**156.40**	**157.51**	**158.69**	**159.94**	**161.26**	**162.66**	**164.13**	**165.69**	**167.34**	**169.08**	**170.92**	**172.87**	**174.92**	**177.10**

Levellised COG

Per Unit Cost of Generati	Unit	Levellised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	**1.08**	0.72	0.76	0.81	0.86	0.91	0.97	1.03	1.10	1.17	1.24	1.32	1.40	1.49	1.58	1.68	1.78	1.89	2.01	2.14	2.27	2.41	2.56	2.72	2.90	3.08
Depreciation	Rs/kWh	**6.64**	7.84	7.88	7.92	7.96	8.00	8.04	8.08	8.12	8.16	8.20	1.57	1.58	1.59	1.59	1.60	1.61	1.62	1.63	1.63	1.64	1.65	1.66	1.67	1.68	1.68
Int. on term loan	Rs/kWh	**5.13**	9.87	8.88	7.87	6.86	5.83	4.79	3.75	2.69	1.62	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh	**0.46**	0.56	0.54	0.53	0.51	0.49	0.47	0.45	0.44	0.42	0.40	0.29	0.29	0.30	0.30	0.31	0.32	0.32	0.33	0.34	0.35	0.36	0.36	0.37	0.38	0.39
RoE	Rs/kWh	**6.95**	6.38	6.42	6.45	6.48	6.51	6.55	6.58	6.61	6.65	6.68	8.48	8.52	8.57	8.61	8.65	8.69	8.74	8.78	8.83	8.87	8.92	8.96	9.01	9.05	9.10
Total COG	**Rs/kWh**		**25.37**	**24.48**	**23.58**	**22.67**	**21.75**	**20.82**	**19.89**	**18.96**	**18.01**	**17.06**	**11.65**	**11.79**	**11.93**	**12.08**	**12.24**	**12.40**	**12.57**	**12.75**	**12.94**	**13.13**	**13.34**	**13.55**	**13.77**	**14.01**	**14.25**
Discount Factor			1	0.863	0.745	0.643	0.555	0.479	0.413	0.357	0.308	0.266	0.229	0.198	0.171	0.147	0.127	0.110	0.095	0.082	0.070	0.061	0.053	0.045	0.039	0.034	0.029

Levellised Tariff	**20.25**	**Rs/Unit**

ANNEXURE-V

Determination of Accelerated Depreciation Benefit for Solar PV Power Projects

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	80%
Income Tax (MAT)	19.9300%
Income Tax (Normal Rates)	33.2200%
Capital Cost	1570.0

Years ---------->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation		2.64%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	2.88%	0.00%	0.00%
Book Depreciation	Rs Lakh	41.45	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	82.90	45.22	0.00	0.00
Accelerated Depreciation																					
Opening	%	100%	60%	12%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Allowed during the year	%	40%	48.00%	9.60%	1.92%	0.38%	0.08%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	60%	12%	2.40%	0.48%	0.10%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelrated Deprn.	Rs Lakh	628.00	753.60	150.72	30.14	6.03	1.21	0.24	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Depreciation Benefit	Rs Lakh	586.55	670.70	67.82	-52.75	-76.87	-81.69	-82.65	-82.85	-82.89	-82.89	-82.90	-82.90	-82.90	-82.90	-82.90	-82.90	-82.90	-45.22	0.00	0.00
Tax Benefit	Rs Lakh	194.85	222.81	22.53	-17.52	-25.54	-27.14	-27.46	-27.52	-27.53	-27.54	-27.54	-27.54	-27.54	-27.54	-27.54	-27.54	-27.54	-15.02	0.00	0.00
Energy generation	MU	0.70	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Discounting Factor		1.00	0.93	0.80	0.69	0.60	0.52	0.44	0.38	0.33	0.29	0.25	0.21	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.07

Levellised benefit	**3.17**	**Rs/Unit**