KERALA STATE ELECTRICITY REGULATORY COMMISSION
THIRUVANANTHAPURAM

PRESENT: Sri.T.M. Manoharan, Chairman
Sri. K.Vikraman Nair, Member
Sri. S. Venugopal, Member

No. 60 /SEA/CSEZA/Solar/2014

In the matter of approval for the installation of grid interactive solar roof top system by Cochin Special Economic Zone Authority to meet its solar energy purchase obligation.

Cochin Special Economic Zone Authority : Petitioner

Order Dated 18.06.2015

1. Cochin Special Economic Zone Authority (hereinafter referred to as CSEZA or the licensee) is a distribution licensee for the Cochin Special Economic Zone. The licensee had, as per its letter No. B-5/1/2013:CSEZA/6685 dated 30.12.2013, submitted an application for the approval of its project to install a 200 kWp grid interactive solar roof top system on the roofs of the buildings in its premises. The project was envisaged at meeting the solar power purchase obligation (SPO) of the licensee. The Commission had, as per its order dated 04.04.2013, fixed the renewable energy purchase obligation (RPO) at 3% of the total energy consumption, out of which the solar power purchase obligation was 0.25%. The RPO and SPO have to be increased by 10% every year. The SPO of the licensee was estimated at 1.51 lakh units per annum. The detailed project report for the installation of 200 kWp grid interactive solar roof top system was prepared by M/s KITCO Limited which is a Public Sector Undertaking. The total cost of the solar roof top system was estimated at Rs.2.68 crore excluding the supervision and overhead charges. Including the supervision and overhead charges the gross expenditure for the project was estimated at Rs.2.95 crore. The internal rate of return was estimated at 14.33% and return on investment was assessed at 18.3%, considering the tariff for solar energy at Rs.16 / kWh.

2. As per the data submitted by the licensee the energy requirement of the licensee will increase from 60.72 MU to 72.52 MU during the period from 2014-15 to 2023-24. During the above period the SPO of the licensee will increase from 0.1518 MU to 0.4275 MU. For meeting the SPO for the year 2023-24 a solar photo voltaic (SPV) plant of 400 kWp will have to be established. But the licensee

proposed to install a 200 kWp solar system initially during the year 2014-15. As per the project report the licensee proposed to install mono-crystalline SPV system and the anticipated power generation was 0.3 MU considering a generation at the rate of 5 units per day for 300 sunny days / year. The licensee justified the investment in the project on the ground that if the project is not implemented it will have to purchase solar REC at a rate of Rs.12 / unit. Therefore the units of solar energy generated can be assumed as savings of Rs.12 / unit. The power purchase cost incurred by the licensee was at a rate of Rs.4.40 / unit. Therefore the licensee estimated that the total gain would be at the rate of Rs.16.40 / unit. The licensee had pointed out that the solar energy system proposed to be installed by them has a cell efficiency guaranteed for 25 years. The internal rate of return (IRR) was assessed at 14.33% and the return over investment (ROI) was assessed at 18.30%. Since the solar energy system was proposed to be implemented for meeting the SPO of the licensee, it did not avail subsidy from Government of India. Hence the rate was worked out at the market rate for solar panels with efficiency of 22%. The licensee submitted that the conventional panels are only 14% efficient. The abstract of the anticipated expenditure for the proposed project was as given below,-

Sl. No.	Specification	Price (Rs.)
1	Mono crystalline (320 Wp) (650 no's)	1,86,57,600
2	Inverter : SMA STP 20000 TLEE (10 no's)	40,82,500
3	Module mounting structure	12,89,600
4	A) Array junction box (cape electric / any reputed) B) Cables & Accessories (Havells / V Guard / any reputed) C) Main Junction Box D) Earthing & Lightning protection	28,03,618
	Total	2,68,33,318

3. The licensee had also submitted a comparison of the cost and benefits of indigenous panels and high end imported panels. The reasons stated for preferring imported panels for the project are the following,-

    i) The imported panels require only 1100 – 1200 sq. m whereas conventional panels required 1600 – 2000 sq. m.
    ii) The efficiency of imported panels is 22% whereas the efficiency of indigenous panels was only 14%. Therefore imported panel was anticipated to generate energy at a rate of 5 units / kWp / day as against the generation of energy by indigenous panels at the rate of 4 units / kWp /

day. The imported panels were suggested in view of the higher return on investment and minimum space available for installation.

Reduction in carbon emission, reduction in electricity bill, minimum maintenance cost, reduction in heat load of the building etc., have also been cited to be the benefits of the project. The licensee had also submitted the table of computation of internal rate of return.

4. The Commission had made an analysis of the financial viability of the proposed project, considering the following features of the project,-

(i) Capital cost	-	Rs.268.33 lakh
(ii) Capital cost including overhead and supervisions charges of KITCO	-	Rs.295.16 lakh.
(iii) Power generation	-	3 lakh units / year
(iv) Life of the project	-	25 years
(v) O&M expenses	-	Rs.1 lakh

5. The following limitations were noted by the Commission,-

(i) Alternate proposals were not considered since the imported panels proposed by CSEZA would cost 30% more than the conventional panels.
(ii) The option of availing subsidy (30% of the capital cost) was not considered.
(iii) The viability was worked out excluding the supervision charges of M/s KITCO.
(iv) The price of solar REC was assumed to be Rs.12 / unit whereas the actual rate of solar REC was only Rs.9.30 / unit.

6. The initial analysis done by the Commission revealed that the project with the imported panels as proposed by CSEZA can generate IRR at the rate of 14.44% only, if tariff is assumed to be Rs.13.70 / kWh. When the supervision cost of KITCO is also included, the IRR falls down to 12.90%. On the other hand the conventional panels with lower efficiency and lower investment can attain an IRR of 16.03% with the tariff of Rs.13.70 / kWh. If the Government subsidy of 30% is also availed, the IRR would increase to 23.58% for the conventional panels. It was noted that the lower efficiency of conventional panels would easily be overcome by the lower project cost of the conventional panels.

7. The Commission as per letter No.60/SEA/CSEZA Solar/2014 dated 04.06.2014, forwarded a copy of the assessment of financial and economic viability of the project to the licensee for its comments. The licensee as per its letter No.B-5/1/2013:CSEZA/4983 dated 28.10.2014 submitted their comments. The licensee, in conclusion of its report submitted that it had considered imported panels since the available area is limited and the SPO can only be met with

higher efficiency panel. The area required for installation of imported panels is only 5.5 sq. m / kWp whereas the conventional panel would require an area of 9 sq. m / kWp. Additional area to meet the installation of conventional panel is not actually available at site and hence the licensee requested to approve the proposal to install imported panel with better life cycle cost.

8. The Commission as per its letter No.60/SEA/CSEZA Solar/2014 dated 24.11.2014, communicated its decision to give in principle approval for the proposal of the licensee to install roof top solar system to meet their SPO. The in principle approval was granted subject to the following conditions and observations,-

    (i) The Cochin Special Economic Zone Authority shall adopt fresh transparent process of bidding to implement the project on EPC / turnkey mode.

    (ii) If the project is executed on EPC / turnkey mode, the supervision cost can be minimized.

    (iii) The supervision of the execution of the project shall be entrusted to an agency with expertise in this field.

    (iv) The proposed rate of supervision cost at 7.5% of the total project cost appears to be excessively high.

    (v) While selecting the supplier and insisting on warranty from such supplier, it shall be ensured that the supplier will continue to function in the warranty period and will satisfy the warranty conditions.

    (vi) The claims with regard to more efficiency have to be verified and convinced.

9. It was also directed to submit records and additional information, if any, to justify the following grounds taken by CSEZA for substantiating its claims,-

    (i) The panels considered for solar roof top system by CSEZA are more efficient by about 50% than the conventional solar panels and as much as 100% more efficient than thin film technologies

    (ii) The light induced degradation seen in the standard solar cells can be minimized.

    (iii) The imported panels are more light responsive, that is they wake up earlier in the morning and ‘stay up’ later in the evening and therefore such panels make optional use of precious day light hours.

    (iv) The imported panels have broader spacial response.

    (v) The imported panels produce more energy even at the higher temperatures in hot sun.

10. In response to the letter of the Commission dated 24.11.2014 the licensee, as per their letter No. B-5/1/2013:CSEZA/25 dated 30.12.2014 informed that the licensee had adopted transparent e-tender process after giving wide publicity for the work of design, supply, installation, testing and commissioning of 200 kWp solar photo voltaic system with solar tracking. It was also informed that after negotiation, M/s KITCO has reduced the supervision charges to 7.5% from 10%. The Commission in its meeting dated 20.01.2015 decided to approve the proposal of the licensee for the installation of SPV integrated project. As per letter No. B-5/1/2013:CSEZA/2158 dated 29.04.2015 the licensee requested the Commission for an appointment to its team for a discussion in the matter and further stated that they had negotiated and reduced KITCO's supervision cost from 7.5% to 4% of the project cost. Accordingly the Members of the Commission discussed the issue with the team of officers of the licensee and the Consultants of the licensee at 4 PM on 12.05.2015 at Infopark, Kochi. The team of officers once again presented the details of the project with a view to justifying the project cost of Rs.291 lakh. It was submitted that the imported panels have higher efficiency of 22.5% and the roof area the available is only 1510.36 sq. m. In order to meet their SPO 200 kWp panel would be required. It was also submitted that the expected generation from the imported panels for 25 years would be 8390273 units whereas the conventional panel would generate only 6119027 units. Additional units that would be produced by the panels proposed by the licensee will be 2271246 units and consequent additional benefit would be at the tune of Rs.124 lakh. They had also submitted a comparison with the products under various government schemes as follows,-

Sl. No.	Description of work	Quoted amount Rs. P	MNRE amount Rs. P	ANERT Amount Rs. P
	Benchmark cost /w	-	90	73.5
1	Price for 200 kWp	29100000	18000000	14700536 (considered 50 kw of solar connect scheme)
2	Modules	High efficiency @ 22.5%	Efficiency @ 15%	Efficiency @ 15%
3	Structure	Special structure	Normal structure at flat roof	Normal structure at flat roof
4	Area / kWp	5.5 sq. mtr	9 sq. mtr	9 sq mtr
5	Height of structure	High @ 5.5 Mtrs	Low @ 1.5 Mtrs	Low at 1.5 Mtrs
6	PCU	Imported with high efficiency	Indian or any IEC std	Indian or any IEC std
7	Communication system	Available	Not considered	Not considered
8	Taxes & Duties	Inclusive	Extra	Extra
9	Maintenance of plant	Considered in design & price	Not considered	Not considered
10	Weight (PV Modules & Structure)	151 tons	200 tons	200 tons

11. The Commission has considered the cost of solar plants as approved by Central Electricity Regulatory Commission in its order dated. 31.03.2015. The cost of solar plants and the rate of solar energy as approved by CERC are as given below,-

The cost of solar plants and the rate of solar energy as approved by CERC Order dated 31-03-2015

Installed Power Generation Capacity	1 MW
Useful Life	25 Years
Solar PV Power Projects Capital Cost	605.85 lakh
Capacity Utilization Factor	19%
Debt-Equity Ratio	70% : 30% 424.10 : 181.75
Debt Component Interest Rate	13%
ROE for first 10 years ROE 11th year onwards	20% 24%
Weighted Average of ROE	22.40%
Discount Rate	10.81%
Income tax	33.990%
Depreciation Rate for first 12 years Depreciation Rate 13th year onwards	5.83% 1.54%
O&M expenses 2015-16 O&M expenses Escalation	13.00 lakh 5.72%
Tariff	
Net Levellised Tariff without benefit for Accelerated depreciation	Rs.6.35/kWh
Benefit for Accelerated depreciation	Rs.0.69/kWh
Levellised Total Tariff	**Rs.7.04/kWh**

The norms for the proposed project shall be limited as per the norms approved by Central Electricity Regulatory Commission as provided in the table above.

Orders of the Commission.

12. After having considered the proposal of CSEZA to install imported panels at a cost of Rs.291 lakh for 200 kWp, which is much higher when compared the rates approved by CERC, MNRE and ANERT and the justifications submitted by the CSEZA for incurring such higher cost, the Commission hereby decides and orders that M/s CSEZA may install the imported solar plants as proposed by them following their rules relating to the procurement of materials and award of works subject to the following conditions,-

    (i) The cost of solar plants provisionally approved by the Commission shall only be Rs.121.17 lakh which is the proportionate cost of solar plants at the rate approved by CERC.

(ii) The parameters such as cost of solar plants, debt equity ratio, useful life of the plant, rate of interest on debt, depreciation, O&M cost, return on equity, discount rate, etc., will be adopted as per the CERC norms as on the date of commencement of commercial operation of the project.

(iii) The CSEZA shall avail financial assistance such as capital subsidy and accelerated depreciation, if any, granted by Government.

Dated this 18th day of June, 2015

Sd/-	Sd/-	Sd/-
K. Vikraman Nair	S. Venugopal	T.M.Manoharan
Member	Member	Chairman

Approved for issue

Secretary