

Minutes of the Meeting

Name of the Committee	Date & Time	Venue
Second Technical Committee Meeting On Solar Photo Voltaic Panels /Modules	17th July 2019 03:00 PM- 05:00 PM	Conference Hall, BEE.

1 WELCOME ADDRESS BY THE CHAIRMAN AND THE CONVENOR

- 1.1. At the outset Shri Sameer Pandita, Director, BEE welcomed the members present at the meeting. Shri Pandita apprised the members about the objective of Standards and Labelling program. The meeting was chaired by Shri Sanjay Kumar, Dy. Director General (Sci. 'F'), NATIONAL INSTITUTE OF SOLAR ENERGY(NISE), Gwalpahari, Gurgaon and Shri Sameer Pandita, Director, BEE, moderated the meeting as the Convenor. The convener extended his warm welcome and thanked Shri Sanjay Kumar , DDG, NISE for accepting to chair technical committee meeting on BEE star labelling program for Solar Photo Voltaic panels.
- 1.2. List of the members who attended the meeting is given in **Annexure A**.

2 PRESENTATION ON LABELLING SCHEME

- 2.1. Initiating the discussions, convener presented the star labelling methodology proposed by BEE in the first technical committee meeting dated 15th April 2019 :-

Table 1 Last proposed star rating table for Solar PV panel

	1 Star	2 Star	3 Star	4 Star	5 Star
Module Efficiency %	≥ 12	≥ 15	≥ 18	≥ 21	≥ 24
Temperature coefficient for power (δ) (% / °C)	≥ -0.45	≥ -0.4	≥ -0.35	≥ -0.28	≥ -0.25

He submitted that based on the inputs received from NISE and other stakeholders in the first TCM, the earlier methodology to star rate the PV modules was not being pursued any further and a new methodology was worked out in accordance with IS:16710.

- 2.2. Convener presented the revised star rating scheme and briefed the committee members about the intent behind it.
- 2.3. He stated that the S&L scheme principally is always technologically neutral and S&L program is intended to help the consumers make an informed choice with regards to cost and energy savings, while buying an appliance/equipment. Additionally, he submitted that launch of a S&L program for Solar PV modules holds great significance in the backdrop of the country's commitment to deploy 100 GW of solar PV by 2022,

out of which 40 GW shall be Roof Top PV. The program is expected to ensure that quality Solar PV modules with verified and differentiated energy performance are available in the markets for the Indian consumers.

2.4. The chair, stated that transformation of Solar PV module performance has been a time taking process, with the efficiency of Solar PV modules being only 8% back in 2006 and reaching up to 18% in the year 2019. The BEE scheme is necessary for upgrading the efficiency of the Solar PV panels. He stated that though some Solar PV modules might not qualify for a 5 star at the moment, however in the due course of time, such Solar PV panels too will also qualify for 5 star.

2.5. Convener thereafter requested NSEFI to present to the committee its observations on the proposed BEE star rating program for Solar PV modules.

2.6. Shri Subrahmanyam Pulipaka, CEO, NSEFI¹, presented the concerns/observations of the federation members on the Solar PV Star labelling scheme. The concerns/observations by NSEFI and the clarification provided by the Convenor to each of the comments are listed below:-

2.6.1. **Observation1:** The aspect of efficiency at different temperatures is questionable as Solar PV modules of some technology will be grouped in higher star rating and some technology will be grouped in lower star rating.

2.6.1.1. **Clarification 1:** Efficiencies at different temperature is of great significance as efficiency presently declared by manufacturers at STC does not represent actual working efficiency. The proposed star rating parameter η_{eff} calculates the effective efficiency in the lines of IS 16170, considering the thermal degradation for the performance of the panels at higher temperature. Moreover, the equation is not empirical, as it is derived based on a detailed climate analysis of 33 Indian cities, located in the 5 weather zones.

2.6.2. **Observation 2:** Since module is not an electrical equipment and its performance is dependent upon allied circuitry, introducing rating only for module based on its lab test efficiency is not advisable.

2.6.2.1. **Clarification 2:** S&L program focuses on the appliance and not on the system in which the appliance is utilised. Convenor cited the example of induction motors, which are used in multiple applications but, the IE rating

¹ National Solar Energy Federation of India.

for the induction motors is based on the energy performance of the motors per se and not on the system of which it is a part.

2.6.3. **Observation 3:** Manufacturers are already being subjected to different testing and certification huddles and this will only add more to their woes

2.6.3.1. **Clarification 3:** S&L program for Solar PV modules is being launched on voluntary basis and it requires output of Solar PV panel to be tested and reported at two more temperatures in addition to the one at STC. Hence it is not adding to the woes of the manufacturers, as this is as per the requirements of IS:16710. Moreover, BEE star rating adds credibility and brand value to Solar PV modules by highlighting its energy performance and provides an informed choice for the consumers.

2.6.4. **Observation 4:** In case BEE wants to classify modules by rating them, it can be done by using the existing test reports of BIS and IEC by incorporating formula from the parameters already tested. This will save the testing efforts from the manufacturer.

2.6.4.1. **Clarification 4:** Test reports as per the BIS (Compulsory Registration Scheme) are mandatory for S&L. However, it is not possible to rate the PV module solely based on a single parameter tested as per BIS only as rating a module/panel only based on the STC will not give correct measure of temperature conditions on performance of Solar PV module. However, if the test reports from BIS/NABL lab contains the power rating of the solar PV module at the module temperatures of 50 and 75 , in addition to STC at 1000w/m^2 , then the star rating would be granted based on these test reports.

2.6.5. **Comment 5:** There is no country that specifically rates modules on efficiency. Star rating should not just consider the efficiency but also other factors like aging and degradation to bring a comprehensive look to the rating mechanism.

2.6.5.1. **Clarification 5:** India wants to lead by an example by introducing S&L for Solar PV panels, and this shall benefit the manufacturers in better positioning their residential / rooftop solar PV products in market and before consumers. Ageing and degradation are quality aspects and accordingly beyond the scope of BEE's mandate. Also, there is no BIS/IEC standard available to measure and verify the impact of degradation and ageing factors on performance of Solar PV module as declared by the manufacturers in their datasheet.

2.7. NSEFI, also submitted that the solar manufacturers had to mandatorily obtain CRS from BIS and the ALMM (Approved List of Models and Manufacturers) from MNRE.

The BEE schedule is expected to add to the financial burden of the solar manufacturers. BEE submitted that, considering this, it had decided to forgo the labelling fees for 5 star rated Solar PV modules during the voluntary regime and kept labelling fees as minimal for remaining levels.

- 2.8. Convener explained that the present star labelling methodology for Solar PV modules is based on the IS :16710. The star parameter, i.e. η_{eff} effective efficiency (equation 1) is derived in such a way that it helps to rate the performance of the PV panel/module based on both efficiencies as well as thermal performance. The weights (0.14, 0.62 & 0.24) in equation 1, are representative of the percentage of total sunshine hours a PV panel/ module is expected to be exposed to the respective temperature. The weights have been determined by analysing the weather data of thirty-three Indian Cities across five climatic zones. This has been vetted by NISE too. The efficiencies of the solar PV module in terms of IS 16710 have to be calculated for the module temperatures of 25, 50 and 75 degree celsius at 1000 W/m² insolation and put in the equation 1 to determine η_{eff} .

$$\eta_{eff} = (0.14 \times \eta_{max,25^{\circ}\text{C}}) + (0.62 \times \eta_{max,50^{\circ}\text{C}}) + (0.24 \times \eta_{max,75^{\circ}\text{C}}) \quad \text{..... Equation 1}$$

Final star rating of the solar PV panel will be based on the effective efficiency (η_{eff}) of the panel/module, as evaluated using equation 1 above.

Table 2 Present Star rating table for Solar PV panels

	1 Star	2 Star	3 Star	4 Star	5 Star
% η_{eff} .	11.50- 12.99	13.00 -14.49	14.50-15.99	16.00-17.49	≥ 17.5

- 2.9. Representative from Jakson solar mentioned that star rating should also cover the reliability and quality of the Solar PV panels, while rating it from 1 to 5 star.

- 2.10. Shri Amit Mittal from First Solar, submitted the following aspects:-

2.10.1. To include Solar PV panel degradation factor in the star rating scheme by assigning some weighting factor to it in the effective efficiency formula.

2.10.2. Ageing can be a quality parameter but, degradation has a direct impact on energy generation performance. Accordingly, BEE should consider the same while providing star rating to a Solar PV module.

- 2.10.3. He submitted considering other environmental factors like energy and water used and the CO₂ emitted during the manufacturing of the PV modules / panels (sustainability of the product) in the star labelling scheme.
- 2.11. The Convenor explained to the participants that the quality and reliability aspects of the appliances is beyond the scope of BEE's mandate. Also, BEE reiterated that tests followed for Compulsory Registration Scheme (CRS) of BIS already covers the reliability and safety aspects and CRS has been kept as a pre-qualification criteria for obtaining a BEE star rating for the Solar PV module. Convenor encouraged manufacturers to forward a proposal on inclusion of impact of the degradation and ageing based on an internationally accepted standard. He also submitted that, BEE could not consider the impact of degradation and ageing on performance of Solar PV modules based on the details provided in the data sheet without any way to practically quantify it.
- 2.12. The experts from test labs (CPRI, UL and TUV) mentioned that currently testing has been done up to the module temperature of 50°C. However, it was possible to raise the module temperature to 75°C and test the panels as per IS16170-1/IEC 61853.
- 2.13. Dr Som Mondal from TERI School of Advanced Studies highlighted the following aspects:
- 2.13.1. In the proposed star labelling methodology, the NOCT effects are not captured.
- 2.13.2. As the PV panels from different manufacturers have different NOCTs, it is not fair to measure the performance of PV panels at a set/fixed module temperature instead, it will be fair to test at a set/fixed ambient temperature.
- 2.13.3. He recommended changing the name of *effective efficiency* to *efficiency in the first year*.
- 2.14. Representative from Mundra Solar (Adani solar) recommended rating the PV modules based on the energy generated (as per IEC 61853) instead of the peak power and efficiency.
- 2.14.1. Convenor addressed the above concern stating that the adoption of IEC61853 or IS16170 in totality for rating the PV module will increase the burden on manufacturers, and also it is not possible to have climate-specific energy rating under the S&L program; as BEE does not have control over the supply chain and it will lead to confusion amongst the consumers.

2.15. Representative from Mundra Solar expressed concerns on the area of PV modules being used in determining the efficiency of the Solar PV panel/ module. He mentioned that there is no standardised procedure for determining the area.

2.15.1. Shri Nitish from EDS clarified the concern by stating that presently the manufacturers declare the panel efficiencies based on gross area (i.e., area including the frame). Hence, the existing industry practise will be adopted for determining the panel efficiency.

2.16. Shri CK Verma, Chief Engineer, CPWD submitted that:-

2.16.1. Only 5% model share is expected to be eligible for the grant of 5 star rating based on the market study conducted on 279 panels covering all types of technologies from 3Wp to 445Wp of 14 major brands. This may lead to market monopoly of only some brands.

2.16.2. With the Prime Minister focus on “Make in India”, BEE should align its program with this initiative, so that local manufacturers may not be affected by this regulation.

2.17. Convener stated that, the 5 star rating of BEE is always kept aspirational, so that manufacturers can put effort into R&D to strive for developing more efficient products. He mentioned that it was only the beginning of the program and gradually as market transformed, the 5 star market share shall pick up with the demand.

2.18. He also submitted that to support the “ Make in India” initiative, BEE has set company registration fees for Indian MSME at Rs. 25,000 only, as compared to large manufacturers, who have to pay Rs. 1,00,000/-

2.19. **S&L Scheme** -With regards to the S&L scheme for Solar PV Modules, BEE stated that each manufacturer has to first register his company under BEE scheme by making one-time payment of Rs. 25,000/- for MSME and Rs.1,00,000/- for rest of the manufacturers. This amount is refundable. After company registration, the manufacturers can register Solar PV modules by submitting all applicable mandatory BIS CRS certificates and a test report from a NABL/BIS approved laboratory, containing efficiencies at module temperatures of 25, 50 and 75 degree Celsius at 1000 W/m². The application fees for each model is Rs. 2,000 only and fees for renewal/degradation for each model will be Rs.1,000 only. The labelling fees of 2.00 paise per watt for each manufactured Solar PV module/panel shall be charged by BEE. However, the labelling fees for 5 star rated models would be waived off. The label validity period would be effective from the date of launch till 31st December 2020.

2.20. **Check Testing** -BEE also described the check testing scheme carried out by it. Under this, any BEE registered Solar PV sample, would be picked up from the market randomly and tested at a BEE empanelled Lab. If the first sample fails, then a second check testing would be carried out. Under second check testing, two similar Solar PV modules/panels with same rated efficiency would be picked up again from the market randomly and both samples would have to meet the declared effective energy efficiency levels. Even if one sample fails during second check testing, the Solar PV module will be treated as being in non-compliance with prescribed BEE standards.

2.21. **Label Material and placement**- The manufacturers recommended that the BEE star label may be placed at the back of each panel. They also proposed label to be polyester.

3 CLOSING REMARKS BY THE CHAIR

The Chair Shri Sanjay Kumar, Dy. Director General, NISE, stated that CRS of BIS, ALMM of MNRE and proposed BEE S&L program for Solar PV are progressive initiatives to help the manufacturers improve their respective products. All these certifications are to ensure the quality, safety and energy efficiency of the Solar PV modules. Accordingly, all members should proactively participate in the BEE program to make it a success. Additionally, the BEE program will provide consumers with an informed choice at the time of purchasing the Solar PV modules suiting their requirements. He also stated that, NISE had conducted a study on the degradation of solar panels along with IIT, Mumbai which indicated that the range of degradation was very high, making it difficult to quantify and measure its impact on performance of Solar PV panel.. Also, he reiterated that BEE cannot take onus of product quality as it is beyond its scope. Moreover, he expressed that advancements in Solar PV technology is happening at a rapid pace, and introduction of S&L program at this stage will add more value to the Solar PV industry and its products. Besides, he mentioned that area availability for PV installation is of great concern, therefore promoting the efficient PV modules is of utmost importance, which is expected to eventually lead to decreased area requirement per unit of the power output in the years ahead. Finally, he wished good luck to all the participants and anticipated that this program will be a global trendsetter.

ANNEXE A: PARTICIPANTS IN TCM

S.N.	Shri Sanjay Kumar, Chair	Dy. DG, NISE
1.	Shri Sameer Pandita, Convener	Director, BEE
2.	Shri T P Ashwin	Project Engineer, BEE
3.	Shri Yogesh Kumar Singh	Sr Research Scientist, NISE
4.	Dr Som Mondal	Assistant Professor, TERI SAS
5.	Shri Subrahmanyam Pulipaka	CEO, NSEFI
6.	Shri Vishal Sinha	Lead, Module Sales, Vikram Solar
7.	Shri Amit Mittal	Technical Director, First Solar
8.	Shri Avinash Haldkar	Assistant Manager, Waaree Energy
9.	Shri Vishanth Venkatesh	Head-Product Manager, Solar-Manufacturing, Mundra Solar (Adani)
10.	Shri Himanshu Goyal	Executive- sales and Manager, Renewsys
11.	Shri Pawan Kumar	Manager Quality, Jakson Solar
12.	Shri P Venkateshwar	GM Engineering, Jakson Solar
13.	Shri R. Sudhir Kumar	Joint Director, CPRI
14.	Shri Rajesh Gupta	GM, TUV Rheinland
15.	Ms Moumita Debnath	Senior Project Engineer and Lead- Solar Products, UL
16.	Shri C K Verma	Chief Engineer, CPWD
17.	Shri Nabeel Ahmad	Associate Director, EDS
18.	Shri Mohit Verma	Sr Project Lead, EDS
19.	Shri Nitish	Sr Energy Analyst, EDS