

**BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION  
GANDHINAGAR**

**Petition No. 2018 of 2021.**

**In the Matter of:**

**Petition for adjudication of disputes between the Petitioner and the Respondent under Section 86(1) (e) and (f) of the Electricity Act, 2003 read with Clause 10.4 of Article 10 of the PPA dated 09.12.2010 in the matter of solar power generation at its fullest installed capacity of 5 MW as per the terms of PPA by replacing damaged and deteriorated 13727 Nos. of solar modules by new size and specifications based 8383 Nos. of solar modules to achieve full potential utilization of the installed solar plant.**

Petitioner : Konark Gujarat PV Pvt. Limited  
Building No. 7, Mittal Estate,  
Andheri Kurla Road, Saki Naka, Andheri (East),  
Mumbai – 400059.

Represented By : Ld. Sr. Adv. Navin Pahwa alongwith Ld. Advocates  
Mr. Ashish Jha & Ms. Kaynat Sheikh

V/s.

Respondent : Gujarat Urja Vikas Nigam Limited  
Sardar Patel Vidyut Bhavan,  
Race Course Circle, Vadodara-390007.

Represented By : Ld. Sr. Adv. Mr. M. G. Ramachandran and  
Ld. Advocate Ms. Srishti Khindaria alongwith Ms.  
Sailaja Vachhrajani, Mr. Rakesh Soni & Mr. Kishore  
Lakhani

**CORAM:**

**Anil Mukim, Chairman  
Mehul M. Gandhi, Member  
S. R. Pandey, Member**

**Date: 25/09/2024.**

**ORDER**

1. This Petition, preferred under Section 86(1)(e) and (f) of the Electricity Act, 2003 (“the Act” for brief), seeks the following prayers:

“ .....

- a. *Pass an Order quashing/setting aside the specific unilateral conditions pertaining to installation of Solar PV Modules and ‘CUF’ as well as ‘Base CUF’ imposed by the Respondent vide its communication dated 28.03.2019 and 27.08.2021, which is in contravention of the provision of PPA dated 09.12.2010;*
- b. *Pending final disposal of the Petition, pass an interim Order permitting the Petitioner to replace damaged/deteriorated Solar PV Modules in total of 13727 numbers with an installation of 8383 numbers of new Solar PV Modules, and carry out other necessary repair works in the Solar Power Plant so as to enable the Petitioner to operate the Solar Power Plant at installed capacity of 5 MW in terms of the PPA between the parties;*
- c. *Pass such Order to compensate the Petitioner for loss of revenue on account of rejection of Petitioner’s request to replace such damaged/deteriorated solar modules from the Solar Power Plant;*
- d. *Pass such further order or orders as this Commission may deem fit and proper under the facts and circumstances of the present case and in the interest of justice.”*

## 2. **Facts of the Petition in brief:**

- 2.1 The Petitioner has set up 5 MW Solar PV Project at NH-27, Samakhiyali-Radhanpur Road, Opp.22 KV Sub-Station, Village Shivilakha, Taluka Bhachau, Dist. Kachchh. For this purpose, the Petitioner entered into a Power Purchase Agreement (PPA) dated 09.12.2010 with the Respondent for sale of entire power generated from its Solar Power Plant to the Respondent for a period of 25 years. However, due to subsequent change in the location of the Plant, a Supplementary Power Purchase Agreement was executed on 28.04.2011 between the Petitioner and the Respondent. Relevant terms and conditions of the PPA are as under:

### ***“Article 4.1 Obligations of the Power Producer***

.....

- (ii) *The Power Producer shall construct, operate and maintain the Project during the term of the PPA at his risk.*

*(iii) The Power Producer shall sell all available capacity from identified solar photovoltaic Grid interactive power plant to the extent of contracted capacity on first priority basis to GUVNL and not sell any third party...*

*.....*

*(viii) The Power Producer shall operate and maintain the Project in accordance with Prudent Utility Practices....."*

*.....*

#### **4.2 Obligations of GUVNL**

*.....*

*(i) To allow Power Producer to operate the Project as a base load-generating station.....*

#### **Article 5 – Rates and Charges**

*.....*

**5.2** *GUVNL shall pay the fixed tariff mentioned hereunder for the period of 25 years for all the Scheduled Energy/Energy injected as certified in the monthly SEA by SLDC. The tariff is determined by the Commission vide tariff order for Solar based power project dated 30.01.2010.*

<i>Tariff for photovoltaic project:</i>	<i>Rs.15/kWh for first 112 years and Thereafter Rs.5/kWh from 13<sup>th</sup> Year To 25<sup>th</sup> Year."</i>
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2.2 As per the Certificate of Commissioning dated 22.02.2012 issued by Gujarat Energy Development Authority (GEDA), the Solar Power Plant was commissioned and ready for commercial operation on 18.01.2012. The Petitioner commenced power supply to the Respondent from 18.01.2012 in terms of the PPA dated 09.12.2010. As per Clause 4.1 of the PPA, the primary obligation of the Petitioner was to maintain and operate the Plant, and the corresponding obligation of the Respondent was to allow the Petitioner for O&M of the Plant for continuous power supply to the Respondent. Therefore, it was imperative that the Plant was to be maintained and operated at the installed capacity of 5 MW.

2.3 On 28.03.2019 the Petitioner received a Notice from the Respondent communicating that some of the solar power developers had enhanced capacity of the Plants or were planning to enhance capacity of their Plants to get higher CUF without the knowledge of the Respondent and, in case of any irregularity found in terms of the capacity enhancement mechanism or enhancement of CUF or change

in panels after the COD, the said communication shall be considered as a notice for termination of the PPA without any further notice.

- 2.4 Though the Plant has been generating desired capacity since its installation in 2012, from 2017 onwards down fall in generation was observed. As such, the Petitioner has conducted various inspection/test at the Plant site and found damage/deterioration in the solar modules. On 05.12.2020, the Petitioner had engaged a third-party agency M/s. Meissa Technologies Pvt. Ltd. for conducting preliminary drone thermography test when it was found that 4363 solar PV modules have anomalies. The Petitioner again conducted IV Curve test in entire 5 MW Plant i.e. 24532 Modules. As per the IV Curve report dated 01.02.2021, 56% i.e. 13727 number of PV Modules were found to be highly damaged/ deteriorated. The analysis of both the reports was then performed by M/s.VP Utilities & Services Pvt. Ltd.
- 2.5 The damage/deterioration in the Modules was causing recurring losses to the Petitioner and the Plant was also not able to generate power at its desired capacity i.e. 5 MW. As per the PPA, the Petitioner was bound to generate the required capacity of power and perform the operation and maintenance of the Plant. In view of this fact situation, the Petitioner, on 04.02.2021, wrote a letter to the Respondent stating that 13727 numbers of PV Modules having total Wp capacity of 2829260 were damaged and deteriorated and that same shall be replaced by 8383 numbers of Modules having the same total Wp capacity of 2829260. The Petitioner also informed the Respondent that there would not be any capacity enhancement of the Plant and that the agreed capacity as per PPA would be maintained. However, the Respondent vide letter dated 27.8.2021 informed the Petitioner that their team had carried out inspection on 20.7.2021 and it was found only 765 existing Modules with capacity of 0.1577 MW damaged. The Petitioner was thus permitted to replace only 765 Modules in such a way that capacity of the replaced new Modules did not exceed 0.1577 MW. The Respondent further stated that upon replacement of damaged Modules, the total installed capacity of the Plant shall not exceed the contracted capacity. That apart, the Respondent also stated:

*"2. The total generation of the Project throughout the balance period of the Term of the PPA pursuant to replacement of panels does not exceed the Base CUF. The CUF of the past period from the date of commissioning of the Project till the date of approval of replacement of panels shall be considered as the Base CUF for this purpose.*

*8. If the CUF of Konark increases from the Base CUF as defined in para (2) in any financial year, GUVNL will have right to inspect the Project site and it is found that any of the panels have been replaced without the GUVNL's permission, any generation beyond the Base CUF in any year shall be considered as excess generation and GUVNL shall not make any payment towards such excess generation."*

- 2.6 As regards CUF, it is stated by the Petitioner that, for a Solar Photovoltaic Project (SPV), CUF is the ratio of actual energy generated by the SPV over the year to the equalling energy output at its rated capacity over the yearly period. But it depends on many things, like location of the plant, sun shine hours, type and quality of solar panels used and operation & maintenance standards of the plant. The only relevance of CUF in the context of PPA can be in accordance with Generic Tariff GERC's Order No.2/2010 dated 29.01.2010, the relevant portion of which is as under:

***"4.10 Capacity Utilization Factor (CUF)***

*The energy generation for Solar Power project depends on solar radiation measured in kWh/sq m/day and number of clear sunny days. The output of Solar Cell is measured in terms of Wp (Watt Peak) and refers to nominal power under Standard Test Conditions (STC) (1000 W/m<sup>2</sup>, 25°C, 1.5PM). The capacity utilization factor depends on site specific parameters like insolation & ambient conditions as well as the technology adopted for power generation...."*

- 2.7 It is submitted that the generation fall from the Plant started from the year 2017 and the generation for the year 9 is 71.26% of the first-year generation. Further, year 10 generation is 57.50% of the first-year generation. Thus, it is clear that the installed Modules at the Plant were highly damaged/deteriorated and needed replacement to make the Plant back to 5 MW capacity.
- 2.8 The Petitioner has, therefore, approached the Commission for permitting to replace the damaged/deteriorated Modules of 13727 numbers having total Wp capacity of 2829260 (2.89 MW) with a total of 8383 number of Modules to achieve



full potential utilization of the installed solar Plant as well as to decide and declare that specific unilateral conditions pertaining to installation of Modules and 'CUF' as well as 'Base CUF' imposed by the Respondent vide its communication dated 28.3.2019 and 27.8.2021 is in contravention of the PPA dated 09.12.2010, on the following grounds:

'That the condition pertaining to CUF and Base CUF amounted to unilaterally incorporating a new condition contrary to the terms of the PPA. As per the PPA, Petitioner is entitled to supply 5 MW of power to the Respondent for which the Plant of 5 MW capacity is to be kept fully operational and functional. Therefore, damaged/deteriorated Modules, which are 13727 in number, are required to be replaced by new size and specification Modules of 8383 in number to maintain the same capacity. The act of the Respondent of precluding the Petitioner from installing the said Modules is contrary to the provisions of the PPA. Therefore, the decision of the Respondent to replace only 765 Modules is highly improper. If replacement of Modules is not allowed, the Plant will continue generating lower power causing huge tariff/revenue loss to the Petitioner. The action of the Respondent is contrary to the letter and spirit of the Act which promulgates encouragement and promotion of renewable sources of energy as enshrined in Section 86 (1)(e) thereof.'

**Reply by the Respondent:**

3. The Respondent, by its reply dated 24.12.2021, resisted the averments made in the Petition. It is contended that Tariff Orders of the State Commission are based on the commissioning of the project within the control period and the technology and cost of panels as applicable at the prevalent time. Therefore, installation of new panels may be cheaper and would allow a generator to claim higher tariff. There is no provision in the PPA or Orders or Regulations of this Commission regarding replacement of damaged solar panels during the life of the Project. As per the PPA, the Petitioner is responsible for operation and maintenance of the power project in a prudent manner for supply of contracted capacity to the Respondent throughout the term of the PPA. There may be genuine requirement to replace damaged solar

panels and equipment in order to enable them to fulfil their obligations under the PPA. It is, however, not open to the Petitioner for replacing the solar panel to increase the production capacity and thereby increase the quantum of generation over and above what they would have been able to generate considering the contract capacity as per the PPA and take advantage of higher tariff.

3.1 The Respondent GUVNL submitted that, with a view to streamlining the procedures for replacement of damaged solar panels and at the same time to ensure that the Generators shall undertake such replacement activity which does not result into enhancement in capacity/ increase in generation and injection of energy to take advantage of tariff agreed in the PPA, the Respondent has devised Common Guidelines required to be followed by the Generators for replacement of damaged solar panels. Such Guidelines, which are stated in brief as under, are required to be followed by the Generators in case of replacement of damaged panels:

- “(i) Damaged panels would mean panels that are damaged because of which they are not in a position to generate power corresponding to rated capacity of panels. Such damaged panels would include panels with scratches or cracks, broken panels, burnt panels or any other kind of physical damage. Mere degradation of panels shall not be considered as damaged modules as degradation of panels is a natural phenomenon.*
- (ii) The generator shall have to seek prior permission of GUVNL before replacing any panel or making any modifications in the Project. However, in case the project capacity is below 5 MW and the PPA has been signed with a Distribution Company in the State, then the solar power project may seek prior permission of the concerned Distribution Company.*
- (iii) Upon receipt of request from the generator for replacement of panels, GUVNL/ Distribution Company shall depute a team for physical verification of the solar project. Such inspection team shall consist of representatives from Distribution Companies, GETCO and GEDA.*
- (iv) The Inspection Team shall submit a Report after physically verifying the damaged panels and such report shall be the basis for allowing replacement of panels certified as damaged.*
- (iv) GUVNL/ Distribution Company may issue permission for replacement of damaged panels with panels of the same make and model installed at the time of commissioning of the project as certified by GEDA in the Commissioning*

*Certificate, if available. If the panels of the same make and model are not available in the market, the generator may be allowed to install panels of a different make and model, subject to certain conditions.*

- (v) It is only upon receipt of permission granted by GUVNL/Distribution Companies that the generator shall be eligible to replace the panels certified as damaged.*
- (vi) Once the damaged panels are replaced, the generator shall inform GEDA under intimation to the GUVNL/ /Distribution Company to visit the site and witness commissioning of the new panels.*
- (vii) In case any additional capacity is found to be connected at the time of site inspection, legal action including termination of PPA will be initiated.*
- (viii) If CUF of any Plant increases beyond the Base CUF in any financial year, GUVNL/ Distribution Company will have right to inspect the Project site and if it is found that any of the panels have been replaced without GUVNL's/ Distribution Company's permission, any generation beyond the Base CUF in any year shall be considered as excess generation and GUVNL/ Distribution Company shall not make any payment towards such excess generation..... "*

3.2 As regards the analysis report dated 01.02.2021 of M/s.VP Utilities & Services Pvt. Ltd., it is contended by the Respondent that they cannot verify the authenticity of said M/s.VP Utilities & Services Pvt. Ltd. In view of the Petitioner's request to the Respondent for site inspection, officials from GETCO and GEDA conducted necessary inspection of the Plant when it was found that: "(1) total 765 nos of pv modules found damaged and (2) capacity of removed modules are included in total capacity of plant". In view of this, the Petitioner was permitted to replace 765 damaged modules in such a way that the replaced modules did not exceed 0.1577 MW in order to retain the same level of total power capacity of the system and total generation, thereby the CUF of the project did not increase.

3.3 The cost of solar panel has significantly reduced today since 2010 when the tariff was determined. Taking advantage of the same, some solar power Generators had been trying to add additional solar panels or replacing older panels with more efficiency and receive higher tariff even though the cost associated with the said generation was much lower. If the said solar panels were installed in a separate power project, the tariff as on date available would be Rs.1.99 per unit – Rs.2.50



per unit. This is why the Generators are seeking to install it in older Plants so that higher tariff can be claimed. Therefore, it is contended that, if the Petitioner were allowed to increase Plant capacity and CUF, then this would seriously prejudice consumer interest, as the Petitioner would be getting more tariff, while its cost of production would have gone down. The Respondent has the option to avail cheaper and more economical sources of power and the Petitioner cannot be benefited at the cost of consumers.

- 3.4 That CUF is in fact one of the parameters for determining tariff and any change in CUF (increase or decrease) would lead to a consequential change in tariff as well. The Commission in its Order date 29.01.2010 has noted that there is a declining trend in the cost of Solar PV Projects. Admittedly, the Panels now being installed are not equipments commissioned during the control period of the Order dated 29.01.2010.
- 3.5 The Respondent denied to have imposed any unilateral conditions pertaining to CUF. The Petitioner cannot use the excuse of alleged damage to solar panels to use higher efficiency panels to generate higher CUF while claiming high tariff determined based on certain CUF and costs. The Petitioner has to maintain and operate the Plant at its installed capacity i.e. 5 MW, but there is no obligation on the Respondent as sought to be claimed by the Petitioner. The Petitioner has to operate and maintain the Plant in terms of the PPA dated 09.12.2010 and the Tariff Order dated 29.01.2010 of the Commission, specifying norms of operation, including CUF. Further, the Petitioner under the guise of O&M cannot replace the panels and install lower cost higher efficiency panels while claiming the tariff as per the older panels. The applicable tariff is based on panels being commissioned in the control period of the Tariff Order 2010 and after considering CUF ad costs of panels and the same cannot be claimed for such new panels.
- 3.6 It is further contended that Inspection Team of the Respondent, which included Officer of GEDA, had found 765 modules to be damaged which have been permitted to be replaced. There cannot be any further claim. The claim of the

Petitioner of alleged damage is not due to any *force majeure* event or even otherwise due to any specific reason. The Petitioner has only claimed that there was damage or deterioration. Degradation of solar panels is normal. As per the report dated 01.02.2021 of M/s. VP Utilities Pvt. Ltd., 13727 modules were shown as damaged. Degradation of panels is a known factor and therefore the applicable tariff already accounted for such degradation. As such alleged degradation cannot be considered as damaged panels. Damaged panels would mean panels that are damaged because of which they are not in a position to generate power corresponding to rated capacity of panels. Damaged panels would include panels with scratches or cracks, broken panels, burnt panels or any other kind of physical damage. Mere degradation of panels shall not be considered as damaged modules as degradation is a natural phenomenon. As such, under the guise of replacement, the Petitioner is seeking to claim the tariff applicable in 2010 for equipment installed in 2021. Further, solar tariff order of the Commission dated 29.01.2010 considers the CUF. In view of the fact that taking into account the CUF, the tariff for solar generation has been determined by the Commission based on the high capital cost of solar panels, therefore the Petitioner cannot now claim the same tariff for newer panels.

- 3.7 The Respondent further contended that the Petitioner's claim for number of damaged panels is inconsistent and untenable. As per verification by the Officials deputed by the Respondent, only 765 of the modules were found damaged and therefore only such modules can be replaced. The Respondent denied to have committed any error or arbitrariness in their actions, which are in fact consistent with the PPA and the Tariff Orders passed by the Commission. That, once Commissioning Certificate is issued by GEDA, the Generators cannot alter the capacity of their solar project or the modules/panels based on which the project was commissioned. The Respondent has, however, allowed for replacement of panels in case there is any damage to the project, subject to prior permission as well as physical inspection being carried out by the Respondent GUVNL. This is to ensure that the replacement is only for actual damage to the panels/modules. The Respondent denied that 2.83 MW of Plant was damaged. It is contended that

report of the Inspection Team is based on the actual physical verification of the Petitioner's project conducted by the Officials of GEDA, GETECO and the State Discoms, wherein 765 modules were found to be damaged. The Petitioner cannot claim a right to replace modules which are not damaged. The Respondent disputed the claim of the Petitioner that it was deprived of tariff for 4018 MWh. Respondent stated that, generation during the year 2013 was 9496 MWh and generation for the year 2020 was 6736 MWh and thus difference of generation worked out to 2759 MWh, against which the Petitioner is claiming a loss of 4018 MWh which is incorrect. In any event, the claim of 2.83 MW is even otherwise incorrect. The damaged modules of 765 as verified by the team only amounted to 0.1577 MW which has been permitted by the Respondent.

- 3.8 The Respondent has, thus, contended that the Petitioner is not entitled to any relief as claimed or otherwise. It denied to have contravened any of the provisions of the PPA read with Tariff Orders, nor can the Petitioner be permitted to replace the modules at its own whims and fancies and compelling GUVNL to procure solar power from such new modules commissioned in 2021 at the tariff applicable for control period 2010-2012. Further there is no provision for extension of time under the PPA after commissioning of the project.

**Rejoinder by the Petitioner:**

4. The Petitioner, by filing its Rejoinder dated 15.02.2022, more or less reiterated the averments already made in the Petition. By referring to Articles 4.1 and 4.2 of the PPA, the Petitioner submitted that the primary obligation of the Petitioner is to maintain and operate the Solar Power Plant and the corresponding obligation of the Respondent is to allow the Petitioner to operate and maintain the Plant for continuous power supply to the Respondent. Thus, the Petitioner is only making a plea that its right to operate and maintain the Plant at its capacity of 5 MW should be allowed by the Respondent so as to replace the damaged/deteriorated modules. It had no intention of enhancing the capacity of the Plant. Further, the PPA does not give any authority to the Respondent to lay down guidelines/protocol for O&M or

repairs/replacements. Nowhere it restricts the rights of the Petitioner for operation, maintenance, repair and replacement within the contracted capacity.

- 4.1 The Petitioner submitted that visual inspection for damages or physical damage is not enough to declare degradation of Module. There are inherent/ latent issues which can be seen only by experts using special test methods, tools and techniques. Physically damaged modules can be identified by naked eyes that may or may not impact the module power performance e.g. scratch/dent on frame may not impact whereas burn, cell cracks which cannot be identified by naked eyes but may lead to degradations or hotspots. Though photovoltaic modules are designed to have a lifetime of about 25 years, but different types of external pressure such as temperature, humidity, UV irradiation, rain, snow, hail, wind, sand etc can lead to degradation of the solar photovoltaic modules protective material and contribute to different types of failures/damage. The most common defects that cause damage in the solar photovoltaic modules are encapsulant delamination, encapsulant discoloration, hot spots, snail trails, cracks, hotspots, light induced degradation, physical damage and age degradation. Thus, the correct method to identify damage is via thermography (IR imaging) test, electroluminescence test, PIV test, Riso measurements etc. which are popular tests being followed by all in solar industry to ascertain the damage and its cause.
- 4.2 The Petitioner further pointed out that, since 2017 there has been a shortfall of generation capacity of its Solar Power Plant. Therefore, the Petitioner had engaged a third party agency M/s. Meissa Technologies Pvt. Ltd. for conducting a preliminary drone thermography test. Having found anomalies in about 4364 solar photovoltaic modules, the Petitioner then conducted IV Curve Test in entire 5 MW Plant, i.e. 24532 modules. As per IV Curve report dated 01.02.2021, it was found that in total of 56% i.e. 13727 modules were highly damaged/deteriorated. The Petitioner followed the procedure to seek approval for replacement of the damaged modules from the Respondent, which, without any technical basis, have vide its letter dated 27.8.2021 erroneously conveyed the Petitioner that the replacement of only 765 modules was allowed as being found damaged. The

Respondent has not conducted any technical test, except physical test, to calculate the damage of the modules. By replacing defective, damaged, deteriorated modules, the Petitioner only intended to operate the Plant to its actual capacity.

- 4.3 The Petitioner further submitted that the devised guidelines imposed on the Petitioner by the Respondent, along with CUF and Base CUF, is without approval of the Commission and hence it is not maintainable. These guidelines are not even a part of the PPA. The Respondent has created the sub contract under the guise of guidelines without the permission of the Commission, which is manifestly arbitrary, unjust and unreasonable and without jurisdiction. The Petitioner, therefore, requested to quash and set aside all the unilaterally devised guidelines and various terms like CUF, Base CUF, Average CUF which are enumerated in para 10 and 11 of the reply of Respondent dated 27.12.2021 and also quash and set aside the Respondent's letters dated 28.3.2019 and 27.8.2021. In this context, the Petitioner relied upon a decision of the *Hon'ble Supreme Court in Nazir Mohhamed v. J. Kamala & Ors* reported in *AIR 2020 SC 4321 (para. 37)*.
- 4.4 The Petitioner further submitted that by replacing the modules, it is not taking advantage of the higher tariff. Mere replacement of modules with latest technology against the obsolete one can never be interpreted as an intention to increase the contracted capacity and or to claim higher tariff. The Commission in its Order has not even restricted the CUF for solar power producer. Even the PPA has no provision with regard to CUF. CUF is solely a subject matter of weather condition with regard to solar power generation. As regards the Respondent's refusal to rely on the authenticity of M/s. VP Utilities & Services Pvt. Ltd. (VPSUL), the Petitioner submitted that a third party independent agency can be identified by the Respondent and the Petitioner on mutual acceptance to perform the testing at site to revalidate the field measurements performed by VPSUL.
- 4.5 As against the Para-wise reply tendered by the Respondent, the Petitioner while reiterating what is stated in the Petition, further stated that the Petitioner has suffered loss of 2.83 MW power generation due to damage of 13727 modules,



whereas, according to the Respondent, only 0.1577 MW is the power generation loss which consisted of replacement of 765 modules. That the power producer has absolute and exclusive right to replace the damaged panels under the law, more particularly under the Clause of O&M. Onus of O&M casts upon the Petitioner and the Petitioner is duty bound to maintain its solar project until the contract period i.e. 25 years. By replacing the damaged/ deteriorated modules, the Petitioner will not be enhancing the capacity of the Plant but would achieve its fullest capacity i.e. 5 MW as per the terms of the PPA.

5. It is further submitted that during hearing the Commission vide Daily Order dated 20.03.2023 called for certain details from the Petitioner. The Petitioner has provided a copy of the module data sheet containing information as provided by the module manufacturer. It is submitted that the Petitioner has provided a copy of Solar plant lay out detailing technical details of commissioned solar plant specifying plant layout details of solar modules, inverters etc., location, their number, capacity, string number, row number where total number of modules and inverters etc. installed in the different location. It is submitted that with regard to details sought in para 5.7 (C) & (D) of the Daily Order, a copy of the drone thermography report containing details of individual module analysis specifying the details of each individual module of the plant layout stating row number, segment number, string number, connected inverter, SMB number in respect to defects observed and its impact on energy loss, a copy of the IV curve analysis report to identify degraded module, details of individual module defect considering the drone thermography report, is also provided vide affidavit dated 20.04.2023 to the Commission. It is submitted that a brief analysis of technical report dated 31.01.2021 has already been provided by the Petitioner. It is also submitted that the copy of generation analysis of degradation in module and calculation of loss thereof as per the warranted generation guarantee has submitted by the Petitioner.

**6. Respondent's written submission dated 05.08.2023-**

6.1 It is submitted that the matter in issue relates to the quantum of permitted generation and supply from the 5 MW Solar PV Project which the Petitioner, Konark Gujarat PV Private Limited is entitled to claim at the tariff terms and conditions in the Power Purchase Agreement ('PPA') dated 09.12.2010 with the Respondent- Gujarat Urja Vikas Nigam Limited ('GUVNL') read with Tariff Order dated 29.01.2010 passed by this Commission in Petition No. 02 of 2010.

6.2 The Petitioner had established and commissioned its 5 MW solar power project which was ready for commissioning on 18.01.2012 as per the certificate of commissioning dated 22.02.2012 issued by the Gujarat Energy Development Authority ('GEDA') to the Petitioner. The Petitioner had procured Solar Modules, Panels etc., at the then prevalent cost for commissioning the said 5 MW plant. The installed capacity of 5 MW was also based on the technology and efficiency of the Solar Modules, Panels, etc., then available which had the bearing of the quantum of generation.

6.3 The Tariff Order, 2010 was applicable for Solar Projects commissioned during the control period from 29.01.2010 to 28.01.2012. The Tariff Order, 2010 itself clearly envisaged the progressive reduction in the cost of establishing the solar power project over the years. Para 4.1 of the Tariff Order, 2010 reads as under:

*".....However, globally the costs of Solar PV Projects have shown declining trend over past couple of years, particularly the last few months and similar trend has been projected for the immediate future. In India also, a large number of solar projects have been planned and with increased production facilities, the cost of Solar PV modules is bound to come down.*

*In view of above, the Commission, decides to adopt Rs.16.50 crores per MW as capital cost for Solar Photovoltaic Power Project and Rs.13 crores per MW for Solar Thermal Power Project."*

6.4 The provisions of the PPA dated 09.12.2010 entered into by the Petitioner with GUVNL, inter-alia, provides as under:

*“WHEREAS, the Government of Gujarat through letter dated 14.10.2010 has allocated 5 MW capacity to Power Producer for developing and setting up Solar Photovoltaic based power project in the State of Gujarat.*

*AND WHEREAS, the Power Producer desires to set-up such Solar Photovoltaic Grid Interactive Power Plant of 5 MW capacity at Village- Charanka, Taluka- Santalpur, District-Patan using new Solar Photovoltaic Grid Interactive power plants to procure the Electric Energy and exercised the option under aforesaid regulations, for sale of entire electrical energy, so produced, for commercial purposes from such Project to GUVNL.*

#### **ARTICLE 1:**

##### **DEFINITIONS**

**1.1** *For all purposes of this Agreement, the following words and expressions shall have the respective meanings set forth below:*

.....

**“Installed Capacity”** *means the capacity of the Project at the generating terminal(s) and shall be equal to 5 MW.*

....

**“Project”** *means a Solar Photovoltaic Grid Interactive Power Station to be established by the Power Producer at Village- Charanka , Taluka- Santalpur , District-Patan in the State of Gujarat comprising of 10 numbers of units with an individual installed capacity of 500 KW and a total installed capacity of 5 MW shall include land, buildings, plant, machinery, ancillary equipment, material, switch-gear, transformers, protection equipment and the like necessary to deliver the Electricity generated by the Project to the GUVNL at the Delivery Point.*

.....

**“Scheduled COD” or “Scheduled Commercial Operation Date”** *means 31<sup>st</sup> December 2011.*

.....

#### **ARTICLE 5**

##### **RATES AND CHARGES**

*5.1 Monthly Energy Charges: GUVNL shall pay to the Power Producer every month Scheduled Energy /Energy Injected as certified in the monthly SEA by SLDC the amounts (the "Tariff) set forth In Article 5.2 herein.*

*5.2 GUVNL shall pay the fixed tariff mentioned hereunder for the period of 25 years for all the Scheduled Energy / Energy injected as certified in the monthly SEA by SLDC. The tariff is determined by Commission vide Tariff Order for Solar based power project dated 30.1.2010.*

*Tariff for Photovoltaic project : Rs. 15 /KWh for the First 12 years and thereafter Rs 5/ kWh from 13th Year to 25th year*

*Above tariff shall apply for solar projects commissioned on or before 31<sup>st</sup> December 2011. In case, commissioning of Solar Power Project is delayed beyond 31 December 2011, GUVNL shall pay the tariff as determined by Hon'ble GERC for Solar Projects effective on the date of commissioning of solar power project or above mentioned tariff, which ever is lower.*

*5.3 For each KVARH drawn from the grid, the Power Producer shall pay at the rate as determined by the Commission payable to GETCO from time to time for each KVARH drawn.*

*5.4 Upon the implementation of the Intra-State ABT (Intra State Availability Based Tariff) in the State, the provisions of the Intra-State ABT Regulations shall become applicable automatically if not permitted otherwise."*

- 6.5 It is further submitted that as stated hereinabove the applicable tariff to the project of the Petitioner would be in terms of the Commission's 2010 Tariff Order dated 29.01.2010, the CUF for Solar PV projects was fixed at 20%. The above was fixed "considering the availability of Solar number of sunny days in the State of Gujarat and MoUs signed by several project developers in response to the GoG policy of 2009". The relevant extracts of the tariff order dated 29.01.2010 are as under:

***"5. Tariff for solar PV and Solar Thermal Power projects***

*In view of the foregoing discussions, the various parameters considered by the Commission for determination of tariff are given in the table below:*

***Parameters for determination of tariff***

	<b>Parameter (per MW basis)</b>	<b>Solar PV Power Project</b>	<b>Solar Thermal Power Project</b>
<b>Project Cost</b>			
1	Capital cost per MW ( <b>Rs lakhs</b> )	1650	1300
2	Debt- Equity ratio	70:30	70:30
3	Interest on loan	10.75%	10.75%
4	Return on Equity	14% p.a.	14% p.a
5	Income-Tax for first 10 years	16.995%	16.995%
6	Income tax from 11 <sup>th</sup> year onwards	33.99%	33.99%
7	O&M cost (% of the project cost)	0.5% of the capital cost (Rs. 8.25 lakhs) for the first year with escalation of 5% p.a.	1% of the capital cost (Rs. 13 lakhs) for the first year with escalation of 5% p.a.
8	Insurance Charges	0.35% of net asset	0.35% of net asset
9	Net CUF (at 100% grid & m/c availability)	20%	25%
10	Auxiliary consumption	Nil	10%
11	Actual machine availability	100%	100%
12	Actual grid availability	100%	100%
13	Project life (years)	25	25
14	Depreciation	6% for first 10 yrs. And 2% from 11 <sup>th</sup> year onwards.	6% for first 10 yrs. And 2% from 11 <sup>th</sup> year onwards.
15	Interest on working capital (i) Receivable of one month (ii) O&M expenses for one month	11.75%	11.75%

Based on the various parameters as discussed above, the levelised tariff including RoE of Solar PV power generation, using a discounting rate of 10.19% works out to Rs. **12.54** per kWh and levelised tariff using the same discounting factor for



*Solar Thermal Power generation works out to **Rs.9.29** per kWh. However, the Commission feels that it would be appropriate to determine tariff for two sub-periods: 12 years and 13 years instead of the same tariff for 25 years. Hence, the Commission determines the tariff for generation of electricity from Solar PV Power project at **Rs.15** per kWh for the initial 12 (twelve) years starting from the date of Commercial operation of the project and **Rs.5** per kWh from the 13th (Thirteenth) year to 25th (twenty fifth) year. The Commission also determines the tariff for generation of electricity from Solar Thermal Power project at **Rs.11** per kWh for the initial 12 (twelve) years starting from the date of Commercial operation of the project and **Rs.4.00** per kWh from the 13th (Thirteenth) year to 25th (twenty fifth)year.”*

- 6.6 Further, the Commission had also specified what would constitute Operation & Maintenance of solar panels. The Order dated 29.01.2010, inter-alia, reads as under:

***“4.3 Operations & Maintenance Expenses***

*Operations and Maintenance (O&M) expenses consist of spares, employee cost, administrative and general expenses, repairs and maintenance, and insurance expenses. There is limited operating experience of MW scale Grid-connected solar power plants, in the State as well as in the country. The CERC has, in its order dated 3rd December, 2009 in Suo Motu petition No.284 of 2009, adopted O&M expenses at Rs.9 lakhs /MW for Solar PV Projects and Rs. 13 lakhs/MW for Solar Thermal projects for the first year of operation (i.e. 2009-10) with 5.72% escalation per annum. Solar power plant’s operations and maintenance are carried out through a centralized maintenance system which results in economy in employee expenses, administrative and general expenses. The Commission had proposed O&M expenses for Solar PV Projects at the rate of 0.5% and for Solar Thermal projects @ 1% of the Capital Cost for the first year, to be increased @ 5% per annum from second year onwards. Additionally, insurance cost at the rate of 0.50% of the net asset of the project during the year had also been proposed.*

.....

***Commission’s Ruling***

*The capital cost of Solar power projects is higher than other sources of electricity. The O&M cost at 0.5% for SPV works out to Rs. 8.25 lakhs/MW and 1% for STP works out to Rs. 13 lakhs/MW, which provides sufficient amount to project developers to carry out O&M activities. Moreover the 5% per annum escalation in O&M cost will address the issue regarding incremental cost in O&M cost to maintain plant in proper condition. The proposed rates of 0.5% for SPV and 1% for STP are in line with the rates adopted by the CERC. The rates adopted by the CERC include the insurance cost. However, keeping in view the huge investment involved, the Commission decides 0.35% of the net asset of the project as insurance charge in addition to the O& M charges at the above specified rates.”*

- 6.7 It is submitted that in Order dated 29.01.2010, this Commission has noted that there is a declining trend in the cost of solar PV projects. This Commission has held as under:

**“4.1 Capital cost**

.....

*It is important to note that with the advancement in the technology of the Solar PV based installations, economies of scale and competition would decrease the capital cost for Solar Projects over a period of time which is also envisaged in the Solar Mission of the Government of India. The Commission had, after considering the above aspects, proposed in the draft order a normative capital cost of Rs.17 Cr/MW for Solar Photovoltaic Power projects and Rs. 13 crores /MW for Solar Thermal Power Project.*

.....

**Commission’s Ruling**

*Solar Power projects are environment friendly and helpful in reducing the use of fossil fuel. However, in India, Solar Power projects are in nascent stage of development. As such reliable cost data for solar projects are not available. Objectors have suggested different rates without evidence in support of the rates which they have proposed. The Commission has received a tariff petition from M/s Astonfield Ltd. for 25 MW SPV power projects in which it has proposed capital cost*

*of Rs. 17.55 crore per MW. CERC has in its order dated 3rd December, 2009 in suo motu Petition No.284 of 2009 considered capital cost at Rs.17 crores per MW for Solar Photovoltaic power project and Rs.13 crores per MW for Solar Thermal power project. The project developers have also signed MoU with Government of Gujarat as per the Solar Power Policy, 2009 for substantial quantity of power projects which indicate that Rs. 17crores per MW and Rs.13 crores per MW for Solar Thermal Power Projects are adequate. However, globally the costs of Solar PV Projects have shown declining trend over past couple of years, particularly the last few months and similar trend has been projected for the immediate future. In India also, a large number of solar projects have been planned and with increased production facilities, the cost of Solar PV modules is bound to come down.*

- 6.8 Similarly, for the subsequent control periods, the Commission has issued the Tariff Order, 2012 and the Tariff Order, 2015 determining the Tariff Terms and Conditions for the purchase of electricity by GUVNL from Solar Power Projects commissioned during the respective control periods. In the said Orders the Commission again recorded the trend of decrease in cost of establishing solar projects, as under:

**a. Tariff Order, 2012 (Order No. 1 of 2012 dated 27.01.2012):**

*"2.2 Cost of Photovoltaic Systems*

*2.2.1 Capital Cost*

*The cost of the photovoltaic modules account for more than half the cost of the entire photovoltaic power plant, and hence, have a substantial impact on the resultant Levelized Cost of Electricity (LCOE). However, the photovoltaic module prices, irrespective of module technology, have been steadily declining owing to research and development, industry adaptation and economies of scale. The module prices have declined by more than half over the last decade, and are expected to drop at the same rate in the near future.*

**b. Tariff Order, 2015 (Order No. 3 of 2015 dated 17.08.2015)**

*"2.1.1 Cost of Photovoltaic Modules*

*The cost of the photovoltaic modules account for about half the cost of the entire photovoltaic power plant, and hence, have a substantial impact on the resultant Levelized Cost of Electricity (LCOE). However, the photovoltaic module prices, irrespective of module technology, have been steadily declining owing to research and development, industry adaptation and economies of scale. The module prices have declined by more than half over the last decade. Moreover, the price for modules varies depending on the country of origin.*

- 6.9 The significant reduction in the cost of PV modules, the research and development, the higher quantum of generation from the same installed capacity modules, etc., have been the salient features of the Solar PV Project's generation progressively since the establishment of 5 MW solar power project in January 2012. Over the period the capital cost and other operating cost of the Solar Modules have decreased very substantially resulting in significant reduction in per unit price of Solar Power.
- 6.10 It is evident that what was envisaged was routine maintenance and minor replacement of electronic components, and in no manner the wholesale replacement of the entire generating plant.
- 6.11 The capital cost for establishment of the solar project at that stage was much higher and the tariff as determined by the Commission was a promotional tariff considering the costs and parameters as then applicable. The capital cost for new panels to be installed at this stage is much lower and with much higher efficiency. In fact, the tariff for the new projects being established at present is only in the region of Rs. 2 per unit to Rs. 2.50 per unit.
- 6.12 Operation & Maintenance expenses at Para 4.3 of the 2010 Tariff Order (quoted above) provides for the day-to-day maintenance and this cannot be construed to authorize any of the solar power developers to undertake replacement of solar panels, equipment or incurring of expenditure on capital aspect of enduring nature. Operation and maintenance expenses as defined by the Commission do not

include cost of replacement of capital assets, these include '*spares, employee cost, administrative and general expenses, repairs and maintenance, and insurance expenses*'. The cost of replacement of solar modules forms a part of the capital cost of the project, and thus the cost of replacement, i.e., capital cost, cannot be considered as O&M expenses. The Commission in the 2010 Tariff Order has allocated only 0.5% of the capital cost for O&M expenses which shows clearly that O&M expenses were never meant to include capital expenditure towards replacement of modules. For example, if the boiler of a thermal power plant is required to be replaced, the cost incurred by the Generator for such replacement is to be as capital expenditure. The tariff initially fixed all such capital expenditure to be incurred at the cost of the developer and there cannot be any change. However, if certain routine maintenance work was undertaken on the existing boiler of the said thermal power plant, the same could be categorized as an O&M expense.

- 6.13 In the above background, it is stated that the generators cannot be permitted to replace the solar panels with new panels with much higher efficiency and much lower cost, at be entitled to the same tariff as provided for in the PPA and determined by the Commission in the year 2012.
- 6.14 The tariff provided for in the PPA is based on the costs and expenses prevailing then and the efficiency of the solar panels as then available. The Petitioner in effect is seeking to divorce the tariff determination from the capital cost and efficiency of the panels, which is not permissible.
- 6.15 It is submitted that substantial loss and prejudice that would be caused to the consumers at large if the Petitioner would seek the very high tariff based on historical capital costs, while virtually establishing a new plant at today's capital cost and efficiency. The test is that if the new generating plant was to be established under a separate power purchase agreement, what would be the tariff that the generator would be entitled to.



- 6.16 As according to the PPA, there is no provision allowing the generators to replace the solar panels to increase the output capacity of the solar power projects and thereby increase the quantum of generation over and above what they would have been able to generate considering the contracted capacity as per the PPA.
- 6.17 Upon the request of solar power producers, GUVNL devised a mechanism to streamline the replacement of damaged solar panel and at the same time to ensure that the generators shall undertake such replacement activity which does not result in enhancement in capacity/increase in generation and injection of energy to take advantage of tariff agreed in the PPA. The said common guidelines have been provided in this Order in the forgoing paras.
- 6.18 The Power project developers do not have an absolute and exclusive right to replace the damaged solar panels under law. This has been a consistent stand of GUVNL that the CUF after replacement of panels cannot be more than the Base CUF. This is the policy adopted by GUVNL while allowing the replacement of damaged solar panels which are otherwise not provided for in the PPA. While there may be a genuine need to replace damaged panels, it is, however, not open to the generators replacing the solar panel etc. to increase the installed capacity of the solar power projects and thereby increase the quantum of generation over and above what they would have been able to generate considering contracted capacity as per the PPA and the consideration in the Tariff Order and take advantage of the higher tariff which is available under the PPA as compared to the current market price of solar power. This is to ensure that the replacement is only for actual damage to the panels/modules.
- 6.19 The Petitioner was allowed replacement with certain conditions to ensure the protection of consumer interest. There is no justification for the consumers to pay a much higher tariff to the project, where the project is not permitted to replace the panels with new technology at a much lower cost.
- 6.20 The Petitioner through Letter dated 04.02.2021 had requested GUVNL to give permission for replacement of 13727 Nos of Solar PV Modules having total

capacity of 2829260. This was after the submission of report dated 01.02.2021 by VP Utilities and Services Private Limited.

- 6.21 The inspection of the site was conducted on 20.07.2021 consisting of an inspection team of the four state distribution companies, GETCO and GEDA.
- 6.22 GUVNL vide Letter dated 27.08.2021 conveyed to the Petitioner that in terms of the inspection, 765 modules with capacity of 0.1577 MW were found to be damaged and that the Petitioner was permitted to replace the same in a manner that the capacity of the replaced new modules does not exceed 0.1577 MW and listed other conditions in terms of GUVNL's policy for replacement of solar panels.
- 6.23 It is the stand of GUVNL that if the Petitioner were allowed to increase plant capacity and thereby CUF, then this would seriously prejudice consumer interest, as the Petitioner would be getting more tariff, while its cost of production would have gone down. GUVNL has the option to avail cheaper and more economical sources of power and the Petitioner cannot benefit at the cost of consumers of the State of Gujarat.
- 6.24 The Petitioner cannot exceed plant capacity more than 5 MW and it shall abide by the terms of the PPA. It cannot attempt to increase the CUF without permission from GUVNL.
- 6.25 It is submitted that cost of solar panel has significantly reduced today since 2010, when the tariff was determined. Taking advantage of the same, some solar power generators had been adding additional solar panels or replacing older panels with more efficient solar panels in their old power projects in order to generate more electricity and receive the higher tariff even though the costs associated with the said generation was much lower. If the said solar panels were installed in a separate power project, the tariff as on date available would be Rs. 1.99 per unit-Rs. 2.50 per unit. This is why the Generators are seeking to install it in older plant so that higher tariff can be claimed.

- 6.26 In the Petitioner's own submissions certain panels have been damaged due to 'micro cracks' or resultant damage or 'age degradation'. It is further the Petitioner's own case that micro cracks occur during shipping of panels or during installation, therefore at a belated stage seeking to replace panels that were defective to begin with cannot be permissible. Further, age degradation is a normal phenomenon that will occur over the term of the PPA. It is impossible to fathom that the solar panels installed at the time of commissioning will continue to operate in the same manner throughout the duration of a long term PPA, however the same would not entitle the Petitioner or any similarly placed solar power developers to *en masse* replace the solar panels.
- 6.27 GUVNL allows for replacement of panels in case there is any damage to the project, when the generators may be permitted to carry out repair and maintenance work and replacement of solar modules and this is subject to prior permission as well as physical inspection being carried out by GUVNL. This is to ensure that the replacement is only for actual damage to the panels/modules.
- 6.28 The Petitioner has been well aware that any replacement of panels can be done only after GUVNL verifies the damage. If not, this would allow any generator to install cheaper, more efficient panels with higher capacity/CUF and still claim higher tariff as per PPA.
- 6.29 It is submitted that GUVNL has fairly dealt with the aspect when there is a genuine requirement to replace physically damaged Solar Panels and equipments. However, solar power developers including the Petitioner are responsible for prudent operation and maintenance of the Power Plant and cannot claim any adjustments from time to time arising out of lack of maintenance or imprudent practices. In any event, it is not open to the Solar Power Developers to increase the inherent capacity of the power plant to generate more quantum of electricity over and above what they would have been able to generate before.

6.30 The Petitioner cannot be permitted to carry out replacement without considering factors of CUF and tariff also. The question is not just of capacity. The Petitioner cannot claim the tariff as applicable for panels/modules commissioned in 2010 for panels/modules installed in 2020 or 2021. The PPA also recognizes that the tariff would be applicable as per date of commissioning. Further, not only the capital cost of the Solar Power Plant had declined considerably over the years but also there has been significant technological evolution and availability of higher efficient solar panels and other equipments with lower capital cost. These have resulted in a significant increase in the quantum of generation with the same name plate/ installed capacity of Solar Power Plant.

6.31 Today's market price of modules does not justify making a payment at preferential in tariff allowed in 2010-2012, which was done with purpose of promoting solar projects. Allowing the SPDs to recover today's prices of solar panels, will amount to windfall gains to the agency and burden consumers of the state with higher electricity charges. Therefore, in any event, the Commission should allow only prevailing current prices of solar power for excess generation.

6.32 Further, the Petitioner's claim based on CUF as determined by the Commission vide the 2010 Tariff Order is misplaced. The Commission has fixed CUF of 20%, however most solar power developers have not even achieved even the 20% of the CUF, owing to the nascent stage of solar power projects, as noted by the Commission itself (quoted above). In view of the above, permitting the SPDs to now replace modules to achieve 20% CUF in terms of the tariff order, would necessarily mean that the solar power developers will generate more power than at the time of commissioning. In view of the same, the Commission should necessarily consider the Base CUF of the project.

7. Petitioner's written submission dated 11.08.2023-

7.1 The disputes between the Parties to the present Petition pertains to permission being sought by the Petitioner for replacement of Solar PV Modules solely to

achieve the full capacity of the Solar Power Plant and consequently to further comply with its obligations under the PPA for the sale of entire power generated from its Solar Power Plant to the Respondent for a period of 25 years being the period stated in the PPA.

- 7.2 The Petitioner submits that from 2017 it was observed by the Petitioner that there was reduction in generation from the Solar Power Plant since commissioning in 2010 and accordingly the Petitioner conducted various inspections/tests at the Solar Power Plant.
- 7.3 The Petitioner engaged third party agency for conducting a preliminary drone thermography test and IV curve test for entire 5 MW project capacity i.e., 24532 modules. A third-party agency, M/s Meissa Technologies Pvt. Ltd, conducted a preliminary drone thermography test on December 5, 2020, identifying anomalies in 4363 solar PV modules. The test included photographs illustrating the damaged modules, necessitating replacements. Subsequently, starting in December, the petitioner performed IV curve tests on all 24532 modules within the 5 MW plant. An IV curve report dated February 1, 2021, indicated that 56% of the modules, amounting to 13727, were significantly damaged or deteriorated. The analysis of both the reports was carried out by M/s VP Utilities & Services Pvt Ltd.
- 7.4 The Petitioner submits that as on date 2.89 MW Solar Power Plant is not functioning out of 5 MW because of the damaged / not working 13727 number of Solar PV modules.
- 7.5 Upon identification of the damaged/ deteriorated modules in the Solar Power Plant the Petitioners on 04.02.2021 has written letter to the Respondent stating that after the passage of nine years since installation, a total of 13,727 Solar PV Modules, with a cumulative watt-peak (Wp) capacity of 2,829,260, have suffered damage and deterioration due to various factors. The communication outlines a proposed remedy, wherein the damaged modules would be substituted with 8,383 new modules, maintaining the original total Wp capacity of 2,829,260. It is submitted that this replacement process aims to restore the Solar Power Plant's



agreed-upon capacity as defined in the PPA, without any intention of enhancing the plant's capacity.

- 7.6 The Petitioner submits that PPA is a sacrosanct in nature and it is inviolable. The terms of the PPA are binding to the contracting parties until the existence of the agreement / contract / PPA. No agreement / contract / PPA can be altered except followed by the procedure prescribed under the Law. Unilaterally imposing any conditions in the existing contract is to be considered as *void ab initio*.
- 7.7 It is submitted that the PPA continues to be in operation and power being supplied by the Petitioner to the Respondent consistently. It is submitted that one of the primary obligations of the Petitioner under the PPA clause 4.1 is to maintain and operate the Solar Power Plant and the corresponding obligation of the Respondent is to allow the Petitioner for O&M of the Solar Power Plant for continuous power supply to the respondent. It is emphasized that Article 4.2 of the PPA further obligates the Petitioner to operate and maintain the Solar Power Plant in accordance with Prudent Utility Practice as defined in Article 1 of the PPA. In view of the above, it is imperative that the Solar Power Plant of the Petitioner is to be maintained and is to be operated at its installed capacity i.e. 5MW using prudent utility practices and that no restriction has been mentioned with regards to replacement of defective/ degraded and or damaged modules.
- 7.8 Further, Article 5.2 of the PPA categorically states that the Respondent i.e. GUVNL shall pay the fixed tariff mentioned for the period of 25 years for all the scheduled energy / Energy injected as certified in the monthly SEA by SLDC. The tariff is determined by the Commission *vide* its Generic Tariff Order.
- 7.9 Therefore, the Respondent in terms of PPA cannot restrict the project developer to replace the defective solar PV modules. Under the O&M which is a *non-obstante* clause under the PPA, the Petitioner is mandated to keep Solar Power Plant in proper working condition and supply generated power to the Respondent as per the agreed terms of PPA.

- 7.10 The Petitioner respectfully states that provision of PPA does not restrict any replacement of defective solar PV modules by the Petitioner. Any such restriction stated by the Respondent is not as per the terms of the PPA.
- 7.11 The Respondent on 28.03.2019 sent a letter to the solar power developers stating that some of the solar power developer with whom the Respondent has power purchase agreements, had enhanced capacity of their plants or were planning to enhance capacity of their Plants to get higher CUF after achieving the COD of their projects, without the knowledge of the Respondent. The Respondent stated in the said communication that in case of any irregularity is found in terms of capacity enhancement mechanism or enhancement of CUF or change in panels after the COD, the said communication shall be considered as a notice for termination of the PPA and hence the PPA shall be terminated without further notice. The Respondent has introduced herein the concept of Base CUF.
- 7.12 The Respondent replying to the Petitioner's letter dated 04.02.2021 sent another letter dated 27.08.2021 stating that, *"inspection carried out by the team on 20.07.2021 and as per the inspection report, 765 existing modules with capacity of 0.1577 MW are found damaged. The details of damaged modules is enclosed in Annexure -A."*
- 7.13 On interpreting the letter dated 28.03.2019, it is evident that Respondent unilaterally sought to impose condition pertaining to 'CUF' and 'Base CUF' by incorporating a new condition contrary to the terms of the PPA which consequently amounts to re-writing of the PPA contrary to intention of the parties at its inception despite knowing that there is shortfall in generation.
- 7.14 The Petitioner has challenged the restrictions put up by the Respondent and detailed reply submitted by the Petitioner unilaterally not allowing replacement of deteriorated/ damaged/ defective modules which are affecting power generation from the Solar Power Plant.

7.15 A restriction has been imposed by the Respondent, GUVNL, as evident from its communication dated 27.08.2021, with particular focus on the content within the para 2 which states that-

*"The total generation of the project throughout the balance period of term of the PPA pursuant to the replacement of the panels does not exceed the base CUF. The CUF of the past period from the date of commissioning of the project till the date of approval of replacement of panels shall be considered as the Base CUF for this purpose."*

7.16 The Petitioner submits that devised guidelines imposed on the Petitioner by the Respondent vide its letters with regards to the CUF and Base CUF is without the approval of the Commission and hence it is not maintainable under the various legal provision because it forms a substantial question of law.

7.17 Further, it is pertinent to note that for a Solar Photovoltaic (SPV) Project, Capacity Utilization Factor ("CUF") is the ratio of actual energy generated by the SPV over the year to the equaling energy output at its rated capacity over the yearly period. In simple terms, one plant of 1 MW capacity, does not give output of 1 MW, round the year. But it depends on many things like location of the plant, Sunshine hours, type and quality of solar panels used, operation and maintenance standards of the plant.

7.18 The only relevance of CUF in the context of PPA can be in accordance with Generic Tariff GERC's order No. 2/2010 ("Generic Tariff Order") dated 29.1.2010. The relevant portion of the Generic Tariff Order is reiterated below for ease of reference:

*"4.10. Capacity Utilization Factor (CUF)*

*"The energy generation for Solar Power project depends on Solar radiation measured in kWh/sq.m/day and number of clear sunny days. The output of Solar Cell is measured in terms of Wp (Watt Peak) and refers to nominal power under standard Test Conditions (STC) (1000 W/m<sup>2</sup>, 25°C, 1.5 PM). The capacity utilization factor depends on site specific parameters like insolation and ambient conditions as well as the technology adopted for power generation."*

7.19 The Commission vide Generic Tariff Order has proposed CUF at 20% for SPV and 25% for STP. It is submitted that this Solar Power Plant is under "SPV" i.e. 20% of CUF.

- 7.20 The Petitioner submits that the Commission has determined generic tariff of Rs. 15 per kWh for the initial 12 years, starting from date of commercial operation of the project, and Rs. 5 per kWh from the 13th year to the 25th years, for the Solar photovoltaic projects. Once the Generic tariff is determined and accepted by the Government of Gujarat, all normative parameters including CUF, considered for its judgment get subsumed into it. Therefore, any guideline contrary to its own acceptance and in absence of any legal backing, is invalid and *void ab initio*.
- 7.21 The Petitioner submits that the Respondent has created the sub-contract by passing suo moto guideline without the permission of the Commission, which is manifestly arbitrary, unjust and unreasonable and without the jurisdiction since it raises a substantial question of law being outside the PPA and the Generic Tariff Order of this Commission. [Nazir Mohamed v. J. Kamala and Ors. (AIR 2020 SC 4321)]
- 7.22 Further, as per Order - 14 Rule - 1 (4) a, b and Rule - 2 (a) of Civil Procedure Code – 1908 the court has to frame the issue on fact. The present matter is regarding the right of the Petitioner to operate and maintain Solar Power Plant as per the terms of the PPA. The new guidelines devised by the Respondent by way of its Notice is a separate question of fact and law.
- 7.23 The Petitioner states that, as per Section 181 (3) of the Electricity Act 2003, it is mandatory for the Commission to regulate and approve the devised guidelines imposed by the Respondent inter alia CUF and Base CUF to be published as a draft regulation to give effect as amendment in the Tariff order / amendment in the existing PPA for the information of persons / solar power producers likely to be affected thereby for inviting the objection or suggestions following the procedure prescribed under the Electricity (Procedure for previous publication) Rules – 2005 and shall be finalized after considering such objection or suggestion received.
- 7.24 Hence, in the light of above discussion, the Commission is required to quash and set aside all the unilaterally devised guidelines and various terms like Base CUF,

Average CUF which enumerated in Para 10 of the reply of the Respondent and quash and set aside the Respondent letter dated 28.03.2019 and 27.08.2021.

7.25 The Petitioner submits that the Petitioner has no intention to increase the power generation capacity of the Solar Power Plant. Instead, their objective is solely focused on maintaining the existing capacity of 5 MW. This intention is clearly stated as they seek to replace solar modules, which are integral components of the power plant's operation.

7.26 The Respondent has authorized the replacement of a mere 765 modules, each with a capacity ranging between 335 Wp and 340 Wp. This falls significantly short of addressing the larger issue at hand – the need for the replacement of a total of 13,727 defective, damaged, or inactive modules of the Solar Power Plant. These modules collectively contribute to a substantial power generation deficiency of 2.89 MW. The current course of action, limited to the replacement of a small fraction of modules, fails to adequately rectify the substantial power generation deficit caused by the larger number of faulty modules.

7.27 The Petitioner further submits that the reason provided by the Respondent for allowing replacement of only 765 solar modules *vide* its letter dated 27.08.2023 has been laid down in its Reply. The Respondent in its reply states that the *“Damaged panels would include panels with scratches or cracks, broken panels, burnt panels or any other kind of physical damage. Mere degradation of panels shall not be considered as damaged modules as degradation of panels is a natural phenomenon”*.

7.28 The Petitioner submits that solar modules are designed with a projected lifespan of 25 years. However, it is crucial to acknowledge the influence of various external factors such as temperature variations, humidity, UV irradiation, precipitation (rain, snow, hail), wind, and sand exposure. These elements collectively pose potential threats to the integrity of the protective materials in solar photovoltaic modules, ultimately contributing to a range of distinct failures or damages. Among the most prevalent defects that instigate harm within solar photovoltaic modules



are encapsulant delamination, encapsulant discoloration, the emergence of hot spots, the formation of snail trails, the occurrence of cracks, susceptibility to light-induced degradation, instances of physical damage, and the natural progression of age-related degradation. An understanding of these multifaceted influences and possible defects is pivotal to maintaining the sustained performance and longevity of solar modules over their anticipated operational span.

7.29 The Petitioner therefore respectfully asserts that relying solely on visual inspections or physical damage to determine module degradation is insufficient. Certain underlying or latent problems may remain concealed, necessitating the expertise of specialists employing specialized testing methodologies, tools, and techniques. While visibly damaged modules, such as those exhibiting scratches or dents on their frames, might not necessarily affect module power performance, there exist more complex issues like burns or cell cracks that elude naked eye detection yet have the potential to result in degradation or the development of hotspots. Therefore, a comprehensive assessment conducted by experts is imperative to accurately identify and address these nuanced concerns that may not be readily apparent through visual observation alone. The Petitioner has carried out technical tests at site including drone thermography and IV curve analysis before concluding that modules were degraded/ defected/ deteriorated/ damaged.

7.30 The Petitioner shall be allowed to replace 13727 numbers of damaged Solar PV modules in total by installation of 8383 numbers of new solar PV modules having higher wp capacity and carry out other necessary repair works in the Solar Power Plant to enable the Petitioner to operate the Solar Power Plant at installed capacity of 5 MW in terms of the PPA. The Petitioner once again affirms that the replacement of 8383 numbers of modules at the Solar Power Plant will not increase the capacity.

7.31 The Petitioner's submits that the plea for replacement of solar modules is with an aims to generate power within the contracted capacity of 5 MW under the PPA. It is crucial to assert that merely updating obsolete solar modules with the latest

technology does not inherently indicate an intent to escalate the contracted capacity or seek advantage of higher tariffs.

7.32 Further, the Petitioner is obligated by the PPA terms to deliver a consistent 5 MW solar energy supply. Fulfilling this commitment mandates the optimal functioning of the Petitioner's Solar Power Plant at its 5 MW installed capacity. Hence, the Petitioner's prerogative to replace 13,727 deteriorated solar modules (equivalent to 2.83 MWp) with 8,383 new modules (equivalent to 2.83 MWp) aligns with maintaining the existing watt-peak capacity and operational efficiency of the Solar Power Plant, ensuring its seamless functionality. The Petitioner is seeking replacement only with a bonafide intention within the four corners of the PPA.

7.33 The Petitioner respectfully submits that the Petitioner had made huge investment to the tune of Rs. Sixty-Three Crore Ninety Lakh (Rs. 63,90,00,000) for setting up the Solar Power Plant. It is submitted that the Petitioner has suffered significant losses attributed to a generation shortfall over the past three years and nine months, culminating in December 2022. This period shows a substantial revenue deficit of about Twelve Crore Twenty-One Lakhs (Rs. 12,21,00,000.), from an accumulated loss of approximate Eighty-One Lakh Thirty Thousand (81,30,000) units in generation.

7.34 The Petitioner submits that due to shortfall the Petitioner is unable to service the debt/term loan availed from L&T Financials for setting up the Solar Power Plant. The situation has escalated to the point where our O&M provider, security service contractor, and other entities responsible for daily operations have issued threats to suspend their services unless payments are promptly made according to the scheduled dates.

7.35 The Petitioner reiterates that of about 2.89 MW Solar Power Plant is not functioning out of 5 MW because of the damaged/ deteriorated/ defected/ degraded 13727 number of Solar PV modules resulting into the substantial financial loss therefore it is imperative to replace estimated 8383 Nos. of Solar PV modules to achieve 5 MW of electricity generation. Further, the petitioner will be

spending additional Rupees Eight Crore Sixty-Four Lakhs (Rs. 8,64,00,000) to be invested under operation and maintenance to achieve 5 MW of power generation.

7.36 The Petitioner has placed reliance on the following Judgments.

- (i) GERC Order dated 03.11.2022 in Petition No. 1985 of 2021 (paragraphs no. 9.51 (i) and (ii), 9.52, 9.53, 10.23, 10.24, 10.25, 10.26, 10.27).
- (ii) GERC Order dated 11.06.2021 in Petition No. 1936 of 2021 (paragraphs 11.4 and 12.13).
- (iii) Hon'ble SC Judgement dated 18.11.2022 in the matter of The State Of Madhya Pradesh vs Sew Infrastructure Limited (paragraphs 21, 22, 23, 24).

7.37 Therefore, this Petition is filed to quashing and set-aside impugned letters of GUVNL dated 28.03.2019 and 27.08.2021.

#### **FINDING AND CONCLUSION:**

8. Heard the parties.

8.1 We note that the present Petition has been filed by the Petitioner challenging the communication dated 28.03.2019 and 27.08.2021 of the Respondent whereby the Respondent has informed the Petitioner that the Petitioner would replace the solar PV modules limited to the conditions stated in the said letters and the CUF of the plant will not increase more than "Base CUF". The Petitioner has challenged the said action of the Respondent and sought directives of the Commission to decide and declare that the restriction put up by the Respondent against the replacement/installation of solar PV modules at its existing plant with a condition that the "CUF" of the plant will not more than "Base CUF" communicated by the Respondent vide its letter dated 03.09.2020 and 27.08.2021 is illegal, arbitrary and in contraventions of provisions of the PPA dated 09.12.2010 between the parties and is against the Order of the Commission.

8.2 The following facts are undisputed between the parties:

- (i) The Petitioner is having 5 MW solar PV power project.
- (ii) The Power Purchase Agreement executed between the Petitioner and the Respondent on 09.12.2010. It was agreed between the parties that the electricity generated from the solar power plant of the Petitioner be sold to

the Respondent for entire life of the project i.e. for 25 years. A supplementary PPA dated 28.04.2011 was also entered into between the Parties due to change in Solar Power Plant location.

- (iii) The Solar Power Plant was commissioned and ready for commercial operation on 18.01.2012 as per the certificate of commissioning dated 22.02.2012 issued by Gujarat Energy Development Authority to the Petitioner.
- (iv) The Respondent vide its letter dated 28.03.2019 informed the Petitioner (solar power project developers) that some of the project developers have enhanced their plant capacity or planning to enhance capacity of the plant to get higher CUF after achieving the COD of the project without knowledge of the Respondent. It is also stated that if, any such irregularity is found in terms of capacity enhancement mechanism or CUF enhancement or change of panels after COD shall be considered as notice for termination of PPA and therefore, in such a case PPA shall be terminated without further notice.
- (v) The Petitioner engaged third party agency for conducting a preliminary drone thermography test and IV curve test for entire 5 MW project capacity i.e., 24532 modules. A third-party agency, M/s Meissa Technologies Pvt. Ltd, conducted a preliminary drone thermography test on December 5, 2020, identifying anomalies in 4363 solar PV modules. The test included photographs illustrating the damaged modules, necessitating replacements. Subsequently, starting in December, the petitioner performed IV curve tests on all 24532 modules within the 5 MW plant. An IV curve report dated February 1, 2021, indicated that 56% of the modules, amounting to 13727, were significantly damaged or deteriorated. The analysis of both reports was carried out by M/s VP Utilities & Services Pvt Ltd.
- (vi) The Petitioners on 04.02.2021 has written letter to the Respondent stating that after the passage of nine years since installation, a total of 13,727 Solar PV Modules, with a cumulative watt-peak (Wp) capacity of 2,829,260, have suffered damage and deterioration due to various factors. The communication outlines a proposed remedy, wherein the damaged

modules would be substituted with 8,383 new modules, maintaining the original total Wp capacity of 2,829,260. It is submitted that this replacement process aims to restore the Solar Power Plant's agreed-upon capacity as defined in the PPA, without any intention of enhancing the plant's capacity.

- (vii) The inspection of the site was conducted on 20.07.2021 consisting of an inspection team of the four state distribution companies, GETCO and GEDA.
- (viii) The Respondent-GUVNL vide Letter dated 27.08.2021 conveyed to the Petitioner that in terms of the inspection, 765 modules with capacity of 0.1577 MW were found to be damaged and that the Petitioner was permitted to replace the same in a manner that the capacity of the replaced new modules does not exceed 0.1577 MW and listed other conditions in terms of GUVNL's policy for replacement of solar panels.

8.3 It is noted that the 'Certificate of Commissioning' dated 22.02.2012 shows that-

1. Total Capacity – 5.04104 MW (DC)
2. Type of pv modules- Poly Crystalline
3. Nos. and Capacity of Modules- 6480 modules of 200 W, 9076 modules of 205 W and 8976 modules of 210 W
4. Inverters- AEG make 10 inverters- 500 kW each
5. Connected to GETCO- 66kV Shivlakhya substation

8.4 It is also noted that the Petitioner has carried out third party inspection and performance evaluation of the plant in December 2020 and January 2021. Based on the drone thermography and IV curve testing carried out, a report was issued by VP Utilities and Services Pvt Ltd in February 2021, wherein it emerged that certain modules had degraded due to different types of defects resulting in decline of solar generation. The relevant findings of the report read as:

- (a) Drone Thermography Analysis: Total 4363 anomalies found after conducting the test. The solar pv modules have issues including bypass diode, hotspot cell issue, multi-cell damage, modular power mismatch. It was found that there is energy loss. It was recommended to consider replacement.



(b) IV Curve Testing: Total 13727 modules found to be highly degraded/deteriorated. The test result clearly shows series loss, shunt loss, mismatch loss, reduced current and reduced voltage. More than 50% of the modules are not producing power as per the warranted values.

In the report it is mentioned that CUF of the plant is reduced from 21.59% in the calendar year 2012 to 15.38% in the calendar year 2020 and concluded that 2.83 MW of modules (Nos- 13727) shall be replaced across all inverters of the Project.

- 8.5 It is also noted that the GUVNL staff who visited project site on 20.07.2021 have recorded that 94 pv modules were missing on structure and found as removed from structure at the Petitioner plant. Further it is mentioned that total 765 modules are found to be damaged with total capacity of 0.1577 MW.
- 8.6 The claim of the Petitioner was further substantiated by an important aspect that the CUF of the plant declined from 21.68% in the calendar year 2013 to 15.38% in the calendar year 2020.
- 8.7 The Petitioner has also provided technical details and requisite data in support of its claim for replacement of 13727 solar panels/modules through affidavit dated 20.04.2023.
- 8.8 While going through the Advance Infrared Audit Report submitted by the Petitioner, it is noted that in Advance Infrared Audit, 20069 modules are found healthy and in 4363 modules some anomaly is found. Further 'fault category' wise breakup for the anomaly is provided as under-

<b>Fault Category</b>	<b>Number of Modules</b>
Remediation Recommended	1292
Monitor & Remediate	577
Long-Term Monitoring	2494

8.9 It is also observed that under the head of 'Anomaly Classification', it is written that-

***“Remediation Recommended***

*Modules that pose a significant known energy loss or potential safety hazard on the site which require prioritized attention to recover energy loss and improve site safety.*

*Module level anomalies in this remediation category are likely to be eligible for warranty replacement.*

***Monitor and Remediate***

*Modules with a high probability of causing system energy loss. The choice to remediate modules depends on anomaly density, replacement costs, and replacement availability.*

*It is recommended to determine the performance degradation caused by the anomaly and to process a warranty claim if expected energy loss exceeds manufacturer's thresholds. In many cases, there can be an economic justification for replacing modules in this category even in the absence of a warranty claim.*

***Long-Term Monitoring***

*These modules have a low probability of causing extensive energy loss. These anomalies are unlikely to require remediation immediately but tracking the progression of anomalies over time is recommended.*

*A high density of long-term monitoring anomalies, or specific groupings of these anomalies may be indicative of system serial defects. “*

8.10 It is noted that the Petitioner has also submitted IV Curve testing details for 13727 modules, which are proposed by them to replace. The details are in following format-

S.No.	Date	INV No	SJB No	String No	Module Sr. No.	Radiation	STC Pmax	Fill Factor	Voc	Isc	Vmpp	Impp
-------	------	-----------	-----------	--------------	-------------------	-----------	-------------	----------------	-----	-----	------	------

8.11 We note that the Petitioner has prayed for allowing replacement of damage/deteriorate solar PV modules in total 13727 Nos. with an installation of 8383 Nos. of new solar PV modules and also carried out other necessary repair works to enable the Petitioner to generate the electricity from the plant. We also note that the Petitioner has contended that it has proposed for replacement of modules based on plant performance survey report done by VP Utilities and Services Pvt. Ltd. It is therefore necessary to refer the observation of above agency, i.e. VP Utilities and Services Pvt. Ltd. The relevant portion of the above report is reproduced below:

***“4. MODULE DIAGNOSTIC ANALYSIS***

*(a) Konark performed drone thermography analysis and IV curve testing on solar pv modules to understand the generation shortfall.*

*Drone Thermography Analysis: Total 4363 anomalies found after conducting the test.*

*Observation: The solar pv modules have issues including bypass diode, hotspot cell issue, multi-cell, damage, module power mismatch. It was found that there is energy loss. It was recommended to consider replacement.*

*(b) IV Curve Testing: Total 13727 modules found to be highly degraded/deteriorated.*

*Observation: The test results clearly show series loss, shunt loss, mismatch loss, reduced current and reduced voltage. More than 50% of the modules are not producing power as per the warranted values."*

8.12 As per aforesaid report it is clear that there is drone thermography analysis and IV curve testing on solar PV modules carried out by the aforesaid agency to understand the generation shortfall.

8.13 It is also stated that in drone thermography total 4363 anomalies found after conducting the test. The observations of the drone thermography analysis state that solar PV modules have issues including (i) bypass diode, (ii) hotspot cell issue, (iii) multi-cell, (iv) damage, (v) module power mismatch. It is also state that due to it the energy loss is there.

8.14 It is also stated that in IV curve testing total 13727 modules found highly degraded/deteriorated. It is stated that the test result clearly shows series loss, shunt loss, mis-match loss, reduced current and reduced voltage. Further, it is stated that 50% of modules are not producing power as per the warranted values.

8.15 It is therefore necessary to see the technical data and sheet of 'Vikram solar modules', which were installed at Petitioner plant and technical data sheet of the modules provided by the Petitioner and analyze the same with the testing carried

out by the VP Utilities and Services Pvt. Ltd. It is necessary to refer the observations recorded by the above testing agency which are reproduced below:

“.....

<i>Fault Category</i>	<i>Number of Modules</i>	
<i>Remediation Recommended</i>	1292	
<i>Monitor &amp; Remediate</i>	577	
<i>Long-term monitoring</i>	2494	
<i>Fault Type</i>	<i>Number of Modules</i>	<i>Percentage</i>
-Bypass Diode	1126	25.0%
-Speckled (Short circuit, PID, Design Anomaly)	0	0.0%
-Module Offline	0	0.0%
-Cell	783	17.0%
-Multi-Cell	860	19.0%
-Shading	0	0.0%
-Physical Damage	0	0.0%
-Vegetation	0	0.0%
-Module Power Mismatch	1594	36.0%
-Other	0	0.0%
<i>Total</i>	4363	

<i>Remediation Recommended</i>	
<i>Fault Category</i>	<i>Number of Modules</i>
-Bypass Diode	1126
-Speckled (Short circuit, PID, Design Anomaly)	0
-Module Offline	0
-Cell	103
-Multi-Cell	59

-Shading	4
-Physical Damage	0
-Vegetation	0
-Module Power Mismatch	0
-Other	0
<b>Total</b>	<b>1292</b>

<i>Monitor &amp; Remediate</i>	
<i>Fault Category</i>	<i>Number of Modules</i>
-Cell	402
-Multi-Cell	169
-Module Power Mismatch	6
-Other	0
<b>Total</b>	<b>577</b>

<i>Long-Term Monitoring</i>	
<i>Fault Category</i>	<i>Number of Modules</i>
-Cell	277
-Multi-Cell	632
-Module Power Mismatch	1584
-Other	0
<b>Total</b>	<b>2494</b>

### *Anomaly Classification*

#### *A) Basis Corrective Action Recommended*

##### *Remediation Recommended*

*Modules that pose a significant known energy loss or potential safety hazard the site which require prioritized attention to recover energy loss and improve site safety.*

*Module level anomalies in this remediation category are likely to be eligible for warranty replacement.*



### **Monitor and Remediate**

*Modules with a high probability of causing system energy loss. The choice to remediate modules depends on anomaly density, replacement costs, and replacement availability.*

*It is recommended to determine the performance degradation caused by the anomaly and to process a warranty claim if expected energy loss exceeds manufacturer's thresholds. In many cases, there can be an economic justification for replacing modules in this category even in the absence of a warranty claim.*

### **Long-Term Monitoring**

*These modules have a low probability of causing extensive energy loss. These anomalies are unlikely to require remediation immediately but tracking the progression of anomalies over time is recommended.*

*A high density of long-term monitoring anomalies, or specific groupings of these anomalies may be indicative of system serial defects.*

#### **B) Basis Type of Anomaly**

<i>Cell</i>	<i>Bypass Diode</i>	<i>Multi-Cell</i>	<i>Other</i>	<i>Speckled</i>	<i>Module Offline</i>
<i>Square hotspot in one cell</i>	<i>Typically warmer or 2/3 of module</i>	<i>1/3 Hotspot in more than one cells</i>	<i>Shading, Junction Box issues, etc.</i>	<i>Short-circuit, PID, Multi-Cell</i>	<i>Entire module is warmer</i>

.....”

In the aforesaid advance infrared audit the testing agency has suggested basic corrective actions are categorized in three categories i.e. (i) Remediation Recommended (ii) Monitor and Remediate and (iii) Long-Term Monitoring. The type of anomaly also observed in advanced infrared audit are categorized as (i) Cell, (ii) Bypass Diode (iii) Multi-cell (iv) Other (shading, junction box issues etc.) (v) Speckled (short circuit, PID, multicell) (vi) Module Offline.

8.16 The list of such aforesaid defect and defect observed of 4363 modules which are situated in different rack, panel, severity issue type temperature, longitude, latitude details are provided in tabular form by the Petitioner along with the details of testing carryout by the VP Utilities and Services. We also note that the Petitioner has not submitted that details of above modules specifying the different rack, panel, segments, by the Petitioner. Hence, the Commission is not able to specify the above details while allowing replacement of such modules.

8.17 We also note that the Petitioner has submitted VP Utilities and Services report dated 31.01.2021 for IV curve testing report of the Petitioner plant carried out by the aforesaid agency during December 2020 and January 2021. It is stated that there is found anomalies more than 13000 modules containing the details of the test carried out by the aforesaid testing agency. On verification of the report/table provided by the aforesaid agency, it is found that the details are provided for 13727 modules by the testing agency which consists of the date of (i) testing, (ii) inverter number, (iii) SJB no. (iv) string no. (v) module serial no. (vi) radiation (vii) STC P max (viii) Fill factor (ix) Voc (x) Isc (xi) Vmpp (xii) Impp.

8.18 The Petitioner has also provided the technically Vikram Solar ELDORA POLY-CRYSTALINE SOLAR PV MODULE technical data sheet consist of I-V Curve of PV Module ELDORA POLY-CRYSTALINE SOLAR PV MODULE 210 for the range from 100 Watt/M<sup>2</sup> to 1000 Watt/ M<sup>2</sup>. The performance guaranteed power output of 90% for 10 years and 80% for 25 years provided by the solar module suppliers. The said details is reproduced below:

“ .....

### Features

- High conversion efficiency based on leading innovative photovoltaic technologies
- High reliability with guaranteed 0 – +4.99 Wp power output tolerance, ensuring return on investment
- Withstands high wind-pressure and snow load (passed 5400Pa mechanical loading test), and extreme temperature variations
- Optimal output over decades, with very good low light response

### Quality and Safety

- 25-year limited power output warranty \*\*
- Rigorous quality control meeting the highest international standards
- ISO 14001 (Environment Health and Safety) Certified Factory
- ISO 9001:2008 (Quality Management System) Certified Factory
- IEC 61215, IEC 61730, IEC 61701, CE, UL 1703, MCS
- Strict adherence to Electroluminescence Testing ensuring micro-crack free Modules

### Recommended Applications

- On-grid utility systems
- On-grid commercial systems
- Off-grid ground mounted systems



\* Electrical Parameters tolerance  $\pm 3\%$  except **200W**

Type	ELV 195	ELV 200	ELV 205	ELV 210	ELV 215	ELV 220
Nominal power $P_{mp}$ (W $\pm 4.99W$ )	195	200	205	210	215	220
Nominal voltage $V_{mp}$ (V)	25.65	26.00	26.30	26.60	26.90	27.15
Nominal current $I_{mp}$ (A)	7.60	7.70	7.80	7.90	8.00	8.10
Open circuit voltage $V_{oc}$ (V)	32.80	32.80	33.00	33.00	33.20	33.20
Short circuit current $I_{sc}$ (A)	8.00	8.10	8.20	8.30	8.40	8.50
Module efficiency (%)	13.40	13.70	14.05	14.40	14.60	15.07

$T_c$ of Open circuit voltage ( $\beta$ )	-0.32 %/°C
$T_c$ of short circuit current ( $\beta$ )	0.04 %/°C
$T_c$ of Power ( $\beta$ )	-0.45 %/°C
Maximum system voltage	1000 V(TUV), 800V(UL)
NOCT	45°C $\pm$ 2°C
Temperature range	-40°C to + 85°C

Length	1486 $\pm$ 1.5mm
Width	982 $\pm$ 1.5mm
Height	38mm
Weight	15.5 Kgs
Junction Box	IP65, sunbats / Types with 3 bypass diodes
Cable & Connectors	4mm <sup>2</sup> , TUV & UL Certified, 1000 mm
Application class	CLASS A (Safety Class II)
Front cover	High Transmission, Low Iron, Tempered Glass
Cells	54 pcs poly-crystalline solar cells (156 X 156mm), 2BB & 3BB
Cell encapsulation	EVA (Ethylene VinylAcetate)
Back cover	Composite film
Frame	Anodized aluminium frame with twin wall profile
Maximum surface load capacity	According to IEC 61215, 5400 Pa

### Guarantees and Certifications

Product Warranty**	5 Years
Performance Guarantee**	Guaranteed Power Output of 90% for 10 Years and 80% for 25 Years
Approvals and Certificates	TUV IEC 61215 Ed2, IEC 61730, IEC 61701, UL1703, MCS-3 (Classed)

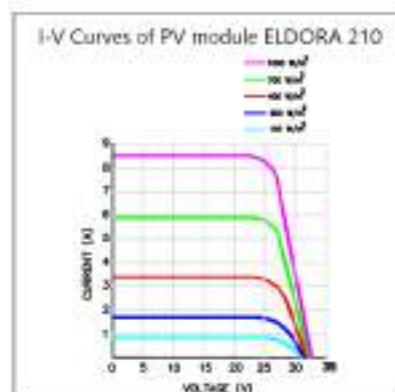
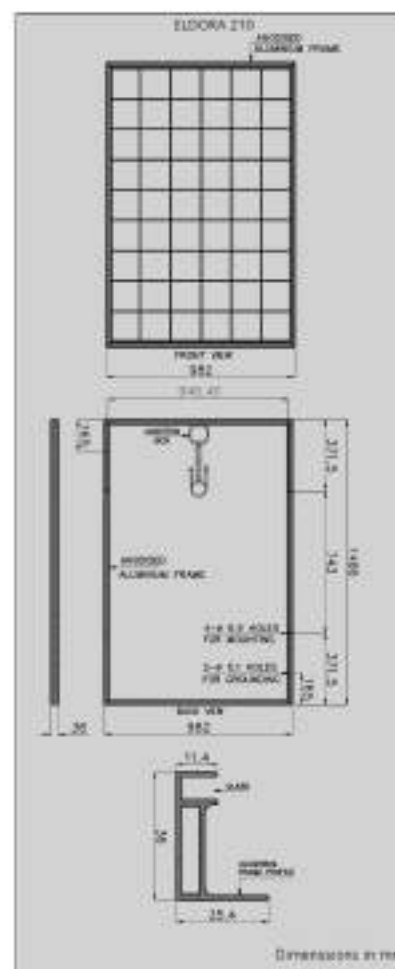
### Packing Information

Quantity/Pallet:	28
Pallets/Container (40'HC):	28
Quantity/Container (40'HC):	784

Your specialty retailer:



\*CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT  
\*\* Refer to Vikram Solar's warranty document for terms and conditions



.....”

8.19 As per the above details it is clear that the performance guarantee output of 90% for 10 years and 80% for 25 years given by the module manufacturer. Thus, it is clear that the modules purchased by the Petitioner is with knowledge and acceptance that the modules installed at its plant are degradable and the module supplier has provided performance guarantee of 90% for 10 years and 80% for 25

years. Thus, the degradation should be 10% to 20%. Hence, the modules which were installed by the Petitioner at its plant during construction with knowledge that they are degradable and affecting the output of the plant. Therefore, the claim of the Petitioner against the same that they are defective and affecting the output of the plant is not correct and valid. So far as the solar modules which are functional and not defective i.e. not generating power is not qualified for replacement as prayed by the Petitioner.

8.20 The Commission has analyzed the data provided for 13727 modules I-V testing carried out by the VP Utilities and Services and observed the following facts reflecting the data submitted by the Petitioner in table below:

Analysis of the degraded modules as per IV chart				
Sr. No.	Range of degradation as per analysis from I V Chart	Total no. of modules		
1	Below 5%	1008		
2	Between 5% and below 10%	325		
3	Between 10% and below 15%	915		
4	Between 15% and below 20%	896		
5	*Positive deviation as per analysis (negative degradation)	823		
	Total	3967		

*\* Note – from the analysis it seems that there is no degradation in the modules Performance efficiency, but it indicates positive value against the standard value for degradation.*

8.21 The detail analysis from aforesaid data carried out by the Commission is kept as **Annexure – I** to this Order.

8.22 From the aforesaid observations, we found that the claim of the Petitioner that from the I-V Curve testing and analysis during December 2020 and January 2021 and report of February 2021 indicates 56% of modules amounting to 13727 Nos. of modules having capacity of 2.89 MW solar power plant is not functioning out of



5 MW because of damaged/not working modules is not correct and valid because the analysis as stated above indicates that the status of the modules on testing date are categorized in (i) non-performing, (ii) over performing, (iii) degraded in the range of 0% to 20%. It is also observed that there are degradation of modules, performance efficiency above 20% than agreed to provide by the module supplier and it also lead to lower generation of the plant. Such modules are having degradation above 20% to 90% and affecting output of the plant but they are not qualifying as defective or damage modules. We have considered for this Petition analysis wherein the Petitioner itself has accepted that modules may be degraded 10%/20% during 25 years of the project life and considered them as not allow for replacement.

8.23 We also note that the technical datasheet module supplier i.e. Vikram Solar provided by the Petitioner indicates that the performance guarantee given by the module supplier is of (i) power output of 90% for 10 years and (ii) 80% for 25 years. Thus, the module supplier has ensured that the modules are operating in the range of minimum of 80% to 90%. As recorded in the analysis that some of the modules are performing well within degradation or 5%, 10%, 15% and 20% also. We also note that while installing the plant the Petitioner itself has considered and purchased the solar modules which are degradable and operate in the range of 90% to 80% during the life cycle of 25 years of the plant. Therefore, the anticipation of the Petitioner that the modules be operate at 100% efficiency without incurring any loss in generation is not valid and legal because while installing the plant the Petitioner has choose/selected the modules which are degradable and affecting the output of the plant. Further, it is not a case that 100% solar modules of 13727 nos. become defective/non-functional as per the analysis of I-V curve data submitted by the Petitioner. We also note that merely degradation of the solar modules is not a ground to allow the Petitioner to replace the modules which are working as per the test report. We also note that the Petitioner plant was commissioned on 22.02.2012. Thereafter, 08 years and 10 months already passed on. With consideration of the life of project completed it is anticipated that the solar modules which are installed by the Petitioner at its plant

by purchasing at relevant time is degradable modules with time and affecting the output is admitted facts. The datasheet submitted by the petitioner for module purchase by it indicates that the modules are degradable and the same degraded within ten years in the range of 0% to 20%. The Petitioner plant has completed 08 years and 10 months from COD. Thus, the modules installed at Petitioner plant are degradable as per the datasheet submitted by the Petitioner. Hence, the claim of Petitioner for the modules degraded upto 20% need to be replaced is not correct and valid because the Petitioner itself has purchased the modules installed at its place are degradable in the range of 0% to 20%. It is not valid reason because the solar modules be degraded within range of 0% to 20% by the Petitioner. Therefore, we are of the view that some of the modules which are either over perform or performing with degradation within range of 20% of the capacity are not permissible for replacement because they are not fall in category of defective modules or damaged modules. But they are functional modules with variance in the degraded output from the plant.

8.24 From the aforesaid observation we are of the view at present 3967 nos. of modules are not replaceable. Out of 13727 modules for which I V testing carried out by the Petitioner 9760 modules only can be allowed to be replaced.

8.25 The Petitioner has submitted the advanced infrared audit report of the testing agency wherein it is stated that 4363 modules have different defects as stated above and 13727 modules are found anomaly and based on it the Petitioner has requested to allow the replacement of 13727 nos. of modules. As recorded earlier part of this Order the Petitioner is eligible to replace 9760 modules out of 13727 nos. of modules. There is no details submitted by the Petitioner wherein it is specified that whether 4363 nos. of modules stated as defective are part and parcel of 13727 nos. of modules or not. Considering the above, we are of the view that the Petitioner is eligible for replacement of **9760** nos. of modules which are degraded above 20% of module capacity or defective or damaged are replaceable.

8.26 Considering the above facts, we are of the view that the claim of the Petitioner that requirement of replacement of 9760 solar modules seems valid. The contention of the Respondent that there were only 765 modules were damaged is not valid and correct, hence the same is not accepted and rejected. We are of the view that the claim of replacement of damaged/defective modules exists at Petitioner's plant as per thermographic/infrared scanning and IV testing carried out by the Petitioner is correct and valid and the Petitioner is eligible to replace the same by new modules such that the plant capacity will not exceed 5 MW.

8.27 Now, we deal with the issue raised by the Petitioner in connection with the specific unilateral conditions imposed by the Respondent vide its communication dated 28.03.2019 and 27.08.2021 for replacement and installation of Solar PV Modules and regarding 'CUF' as well as 'Base CUF'. In this regard, it is noted that this Commission has decided identical matter in Petition No. 2138 of 2022 and its Order dated 06.12.2023 decided that-

*"13.70 We also note that the conduct of the Respondent today in attempting to resile from its promise to compensate the Petitioner for power generated and sold to Respondent by restricting the operation and maintenance of the Project by the Petitioner is in breach of the established principles of promissory estoppel and legitimate expectation.*

*13.71 We further note that the Policy'/ 'Mechanism' / 'Guideline' of Respondent cannot be read as the part of the PPA dated 07.12.2010, since it would amount to alteration of the said PPA which was entered into between Petitioner and Respondent and the same is not permissible.*

*13.72 Considering the above, we are of the view that the Petitioner who is solar PV power project developer is eligible to generate the electricity from its plant capacity limited to 9 MW in terms of PPA and supply the electricity up to 20% of CUF as per the Order No. 02 of 2010 dated 29.01.2010 read with PPA executed between the parties during the period of PPA of 25 years. The restriction put up by the Respondent is against the decision of the Commission in Order No. 02 of 2010 dated 29.01.2010 read with the provision of the PPA and Order of Hon'ble APTEL in Appeal No. 279 of 2013 in GUVNL Vs. GERC and others.....*

*.....*

*13.80 We have gone through the provisions of the PPA as well as our Tariff Order and we find nothing therein to state that if the generating company replace any damaged panels/modules after commissioning of the solar project then the*

*tariff will be revised to that extent in terms of the tariff order applicable during such period. We are of the considered view that tariff is determined considering the investment made by the generating company at the relevant point in time. The Petitioner had made investment for setting up the 9 MW Project during the control period of Tariff Order dated 29.01.2010. Hence, tariff for 9 MW shall be paid by the Respondent in terms of the tariff determined in Order dated 29.01.2010 and as agreed under the PPA.*

....

*13.89 Now we deal with the communication letter dated 03.09.2020 issued by the Respondent communicating to the Petitioner that the Petitioner requires prior approval of the Respondent for replacement of the damaged/defective modules is concerned, the Commission has in earlier part of order dealt the issue and decided that the solar power generator/power producer has duty/obligation to operate and maintain the power plant upto agreed capacity and generate electricity and supply to the Licensee and carry out prudent O&M practice and any default will lead to termination of PPA also. Further the parties are eligible to add/amend or alter the PPA as agreed between the parties. No unilateral amendment or alteration in PPA terms is permissible. We also note that the Petitioner is required to keep the plant upto installed capacity as per prudent utility practice while carry out such function the Petitioner if finds some defective/damaged modules, the power producer is eligible to carry out such work considering the above. We decide that the action of the Respondent, GUVNL, of issuance of communication letter dated 03.09.2020 is illegal, arbitrary and deserves to be quashed and set aside. Hence, the same is quashed and set aside.*

*13.90 We also note that in the present case as the Commission has decided that the Petitioner has right to replace or restore solar PV modules and achieve CUF of 20% in terms of Order No. 02 of 2010 dated 29.01.2010 as well as tariff accordingly as decided in earlier para of this Order. Further, the Commission has also decided that the guidelines for replacement of solar modules issued by the Respondent is illegal and invalid.*

8.28 In view of the above, the present petition succeeds, and we decide as under:

- a. The communication dated 28.03.2019 issued by the Respondent with regard to imposition of "Base CUF" and limiting the tariff/ cost of generation payable to "Base CUF" only is illegal, arbitrary. The Petitioner is eligible to generate and inject the energy from its solar power plant of 5 MW capacity and supply the energy generated from the plant to the Respondent to the limit of 20% CUF.
- b. The Petitioner is eligible to replace only defective /damaged solar PV modules at its 5 MW solar power plant. The defective solar modules at the Petitioner's



plant are 9760 nos. modules replaceable by the Petitioner. All necessary details of such defective/damaged but shall not exceed CUF and modules/parts/equipments specifying the types of defect/damaged part etc. in each module, inverter etc. shall be provided to the Respondent in advance and the Respondent shall verify and confirm such defect/damages informed by the project developer, the same within one month, failing which the Petitioner will be at liberty to replace the defective modules/parts/equipment. If any dispute arises with regard to correctness of replacement of defective, damaged module/equipment of the plant, the parties have an option to approach the Commission for appropriate remedy as per law.

- c. The Petitioner shall provide the details of replaced solar modules intended with new modules specifying the Sr. No of the modules,
  - d. R.F.I.D details or capacity of modules, manufacturer technical details etc. to the Respondent. The Respondent along with GEDA is entitled to verify the same at the Petitioner's plant and confirm the same by issuing certificate for it, within one month from the date of this Order. The Petitioner is not eligible to enhance the capacity of the plant in any case above 5 MW as per the terms of the PPA.
9. With this Order, the Petition, along with Interim Application if any, shall stand disposed of accordingly.

**Sd/-**  
**[S. R. Pandey]**  
**Member**

**Sd/-**  
**[Mehul M. Gandhi]**  
**Member**

**Sd/-**  
**[Anil Mukim]**  
**Chairman**

Place: Gandhinagar  
Date: 25/09/2024.