From the analysis of the data obtained from different agencies, the Commission observed that the O&M expenses for the different MSW projects varies significantly. In view of the above, the Commission proposes to continue with the existing approach of Project Specific determination of O&M expenses for MSW/RDF based on prevailing market trends.

5.8.6 Calorific Value

The existing provision regarding Calorific Value for RDF in RE Tariff Regulations, 2017 is as follows:

> *"82. Calorific Value*
>
> *The Calorific Value of the RDF fuel used for the purpose of determination of tariff shall be at 2500 kcal/kg."*

The Commission has reviewed the norms of Calorific Value for municipal solid waste (MSW) and refuse derived fuel (RDF) considered by various SERCs that are as follows:

Table 49– Comparison of Calorific Value for RDF projects by various SERCs

JERC '19	UERC '18	BERC'17	AERC '18	PSERC'17	CSERC
Project Specific	2500 kCal/Kg	2500 kCal/Kg	2500 kCal/Kg	2500 kCal/Kg	2500 kCal/Kg

In view of the above, the Commission proposes to continue with the existing provisions for RDF as specified in RE Tariff Regulations, 2017. In case of MSW, the Commission proposes to approve the calorific value while determining the project specific tariff.

5.8.1 Fuel Cost

The existing provision regarding Fuel Cost for RDF in RE Tariff Regulations, 2017 is as follows:

> *"83. Fuel Cost*
>
> *RDF price during FY 2017-18 shall be Rs 1,800 per MT and shall be escalated at 5% to arrive at the base price for subsequent years of the Control Period, unless specifically reviewed by Commission. For the purpose of determining levellized tariff, a normative escalation factor of 5% per annum shall be applicable.*
>
> *No fuel cost shall be considered for determination of tariff for the power projects*

using MSW"

The Commission has reviewed the norms of Fuel Cost for refuse derived fuel (RDF) considered by various SERCs which are as follows:

Table 50- Comparison of fuel cost for MSW/RDF projects by various SERCs

JERC '19	UERC '18	ASPERC '18	CSERC '19	AERC '17	BERC'17
Project Specific	Rs. 1800/MT	Rs. 1800/MT	Rs. 1985 /MT	Rs. 1800/MT	Rs. 1800/MT

In the absence of actual data and review of fuel costs notified by various SERCs , the Commission proposes to continue with the existing provision as specified in RE Tariff Regulations, 2017.

Therefore, RDF price during FY 2020-21 shall be Rs. 2084 per MT and shall be escalated at 5% during the Control Period. In case of MSW, fuel cost shall be considered as nil and the Commission proposes to consider the transportation cost while determining the project specific tariff.

5.9 PARAMETERS FOR RENEWABLE HYBRID ENERGY PROJECT

5.9.1 Overview

Draft CERC RE Regulations, 2020 seek to provide the project developers option to use two RE technologies as Hybrid Project in order to optimise the use of resources. It also provides optimal and efficient utilization of transmission infrastructure and better grid stability by reducing the variability in daily and seasonal renewable power generation. Renewable Hybrid Energy Projects can also be seen as alternative for short term power purchase requirement. Regarding Wind Solar Hybrid, MNRE notified National Wind Solar-Hybrid Policy in May 2018. The policy defines various aspects of Hybrid projects. Considering the increasing capacity of RE Hybrid Projects, the regulatory framework is required to be defined for such projects. The issues related to Hybrid projects are discussed as under:

5.9.2 Definition and Eligibility Criteria

Regarding the RE Hybrid projects, the existing RE Tariff Regulations, 2017 provide for determination of Project Specific Tariff for hybrid projects including renewable-

renewable or renewable–conventional sources, for which renewable technology is approved by MNRE. In the prevailing Regulations, hybrid projects include renewable-conventional sources. However, it is proposed that Renewable Energy Projects and Conventional projects shall be treated separately. The tariff for Conventional sources is determined as per Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019. However, Tariff for RE Projects shall be determined under these Regulations. In case both RE projects and Conventional projects are installed and integrated at same point of interconnection, energy accounting for both projects shall be made separately with appropriate metering arrangement.

In view of the above, the Commission, in the Draft CERC RE Tariff Regulations, 2020, proposes to consider Hybrid Projects as combination of renewable-renewable sources integrated at the same point of interconnection.

Further, sizing of the plant depends on the resource availability. Combination of different RE technologies with appropriate sizing will lead to optimal utilisation of existing network.

It is noted that MNRE stipulates that a Wind-Solar plant will be recognized as hybrid plant if the rated power capacity of one resource is at least 25% of the rated power capacity of other resource. However, in case of other RE Hybrid projects e.g., small hydro and Solar PV, the 25% of rated capacity for Solar would be relatively lower. Since, it is minimum sizing criteria, the additional capacity of Solar can be installed.

In view of the above, the Commission proposes that RE projects shall be recognised as Hybrid Projects only if the rated capacity of one renewable energy technology is at least 25% of the rated capacity of other renewable energy technology(ies) and they operate at the same point of interconnection.

As discussed in earlier Section, the floating solar projects may be installed with the existing sites of Small Hydro projects. The usage of water body of Small Hydro projects will give an added benefit. Also, the existing electrical infrastructure can be used for evacuation of power from Floating Solar Plant. In light of foregoing, it is proposed that if the interconnection point of the both projects are different then both

projects are to be treated separately. However, if the interconnection point is the same, then the principles applicable for Renewable Hybrid Energy Projects shall be applicable in such case.

5.9.3 Capacity Utilisation Factor

The RE technologies used for Hybrid projects have different CUFs. The CUF for individual RE technology has been discussed in earlier Section. This CUF shall be considered as ceiling norm. The effective CUF of the RE Hybrid Plant shall be considered based on minimum CUF and rated power capacity of each technology. It is also noted that CUF of the Hybrid Plant shall be measured at interconnection point. In case of Wind Solar Hybrid Project, the minimum CUF has been stipulated as 30%. However, higher CUF can be achieved with the other RE technologies.

Comparative analysis of recent Hybrid Project Tenders has been done to analyse the trend of the Capacity Utilisation Factor.

Table 51– Comparison of CUF for Renewable Hybrid Energy projects

Date of Issuance	Details of the Project	CUF
22-06-2018	2500 MW ISTS-Connected Wind-Solar Hybrid Power Projects (Tranche-I)	40%
30-06-2018	ISTS-connected 2500 MW Wind-Solar Hybrid Power Projects	40%
22-06-2018	ISTS-connected 1200 MW Wind-Solar Hybrid Power Projects in India	40%
08-03-2019	1200 MW ISTS-connected Wind-Solar Hybrid Power Projects in India (Tranche-II)	30%
14-01-2020	1200 MW ISTS-connected Wind-Solar Hybrid Power Projects in India (Tranche-III)	30%
01-08-2019	RfS for Selection of Project Developers for setting up of 1200 MW ISTS-Connected RE Projects with assured Peak Power Supply in India (ISTS-VII)	35%

Further, as per the MNRE guidelines for Tariff Based Competitive Bidding process for procurement of power from grid connected wind solar hybrid project, the declared annual CUF shall not be less than 30%.

In the view of the above, it is proposed that minimum CUF for Renewable Hybrid Energy project shall be 30%. The CUF of the project shall be measured at

interconnection point. For computation of CUF, the rated capacity of project shall be considered in proportion to rated capacity of each Renewable Technology and applicable CUF for such RE Technology. The CUF for each technology may also be measured. However, any underachievement in CUF of particular technology in Hybrid Plant shall be ignored, if the Renewable Hybrid Energy project has achieved the minimum CUF.

5.10 PARAMETERS FOR RENEWABLE ENERGY WITH STORAGE PROJECT

5.10.1 Overview

The generation from RE technologies has been increasing. Large scale Renewable Energy integration with grid has significant challenges, which are both technical and economic in nature. The intermittent generation from Renewable sources due to seasonal weather fluctuations introduces uncertainty in the generation trend.

On 4th January 2017, CERC issued a Staff Paper on Introduction of Electricity Storage System (ESS) in India. This Paper covers the probable uses of storage technologies, operational framework, tariff and other related aspects. Energy Storage System (ESS) is envisaged for optimal utilization of the available generation, shifting of generation at the time when it is required, and utilization of the RE generator for longer period. At present, there are various uncertainties on practical use, applications and the governing market rules for ESS technologies. A well-established policy and regulatory framework at this infancy stage may channelize the investment in this segment of the power sector. The developed countries have already set up several pilot projects. However, in India, at present, there are few projects running based on non-traditional storage technologies.

The grid level applications of Energy storage system include optimization of generation, controlling intermittent generation from RE sources, reliable operation of power system operation, minimizing the deviation from scheduled dispatch or drawl, storage of excess generation of grid, and ancillary services.

ESS can provide a range of services to the electric grid and can be positioned based on their cost and performance. The only electricity storage technology that has been traditionally adopted is pumpstorage hydropower. Storage facilities can be designed with non-traditional technologies such as large number of Electrochemical Battery Cells, Flywheels and Compressed Air Energy Storage.The generic technical parameters about various ESS technologies are as follows:

Table 52–Technical Parameters of various ESS Technologies

Type of Storage	Net Energy Yield	Discharge Capacity	Range of Capacity
Pumped Storage	75-80%	6-10 hours	250-1000 MW
Electrochemical Battery	60-75%	4-5 hours	100-200 MW
Flywheel	80-90%	¼ hours	10-20 MW
Compressed Air	73-80%	8-20 hours	0-180 MW

Considering the increasing need of storage facility in the near future, the regulatory framework is required to be defined for such projects.

Accordingly, in the present draft RE Tariff Regulations, 2020, the Commission intends to propose the regulatory framework to promote use of ESS along with Renewable Energy project. Accoringly, various aspects of RE projects combined with storage technologies viz Battery Storage and Pumped Storage have been discussed in the draft RE Regulations.

5.10.2 Definition and Eligible Storage Technologies

In storage facility, the RE Generator can exercise the option for selecting any storage facility for balancing the generation from project. Such balancing of generation can be for Round the Clock basis or for selected time periods. It is intended that ESS and RE projected shall be connected at the same inter-connection point and energy generated from RE project shall be used as input to Storage. Further, it is noted that Hybrid Policy envisages the use of Storage along with Hybrid Project. Hence, the combination of Renewable Hybrid Energy project and Storage has also been considered as Renewable Energy with Storage Project.

In view of the above, the Commission, in the Draft CERC RE Tariff Regulations, 2020, proposes to consider RE with Stoage projects as combination of renewable including hybrid projects that combines with ESS to use partly or fully renewable

energy generated from such project to store and connected at the same point of interconnection.

5.10.3 Capital Cost

The capital cost of RE woth Storage project includes the capital cost of RE project, capital cost of Storage and other common infrastrucuture. The capital of RE project has been discussed in earlier Section. At such nascent stage, the capital cost of storage cannot be benchmarked. Also, the configuration of storage is depend of RE technologies and applications. Hence, it is proposed to determine the cost of RE with storage project on project specific basis. The capital cost of RE with Storage project shall be determined considering the prevailing market trends.

Similarly, it is also proposed to determine only project specific O&M Expenses considering the prevailing market trends.

5.10.4 Storage Efficiency and Tariff framework

As discussed earlier, pumpstorage hydropower is only electricity storage technology which has been traditionally adopted. As regards Pumped Storage, energy produced by solar power or base load stations during off peak hours is stored through Pumped storage hydroelectric power stations. Further, the energy generated from the water stored in the dams or reservoirs can be used to meet energy needs during peak demand seasons.Lithium-ion batteries are by far the most popular battery storage option today and control more than 90 percent of the global grid battery storage market. Compared to other battery options, lithium-ion batteries have high energy density and are lightweight.

Energy Storage can be conceived as purchase from RE which is used for storage purposes and the sale of such stored energy with fixed and variable charges of the storage system is to be recovered through supply of energy. Thus, cost of stored energy supplied to Grid is nothing but the summation of cost of energy to be stored at project specific Tariff and cost of storage facility. The efficiency of storage facility is important.

The cost of stored energy is dependent on cost of power supplied for storage, efficiency of storage and cost of storage facility. For storage of RE energy in captive / shared hydro station by conservation of water in dam and retrieval of energy later, the operational cost will not change, and energy retrieval will be same as energy

conserved less transmission losses. Also, the cost of stored energy depends on amount of energy stored into storage facility. This means that the sizing of storage facility also affects the output from RE plus Storage Projects. Hence, the Commission intends to provide norms for Storage efficiency. However, the sizing of storage shall be decided to optimise the energy output and balancing the generation from project. Efficiency of storage component of RE with Storage project shall be measured as ratio of output energy received from storage and input energy supplied to the storage component of such project, on annual basis.

In view of the above, it is proposed to specify norms for Storage efficiency as 75% for Pumped Storage and 80% for Battery Storage. Also, the project specific tariff is proposed to be determined for RE with Storage Project.

Annexure-C

BEFORE THE HARYANA ELECTRICITY REGULATORY COMMISSION
BAYS No. 33-36, SECTOR-4, PANCHKULA- 134112, HARYANA

Case No. HERC/PRO-57 of 2019

Date of Hearing	:	**18.12.2019**
Date of Order	:	**20.12.2019**

In the Matter of

Petition for determination of Pre-fixed levelized tariff for purchase of power by Discoms from decentralized Solar Power Plants and other Renewable Energy Generation Plants having capacity of 500 kW to 2MW to be set up by individual farmers/group of farmers/cooperatives/panchayats/Farmer Producer Organizations (FPO) /Water User Associations (WUA) in the vicinity of rural grid sub-stations under Component-A of the Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) Scheme introduced by Government of India (GoI).

Petitioner

Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL)

Quorum

Shri D.S. Dhesi	**Chairman**
Shri Pravindra Singh	**Member**
Shri Naresh Sardana	**Member**

ORDER

1. The present petition has been filed by the Distribution Licensees in Haryana i.e. Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL) on 08.11.2019. The Discoms have prayed that the Commission may determine of Pre-fixed levelized tariff for purchase of power by Discoms from decentralised Solar Power Plants and other Renewable Energy Generation Plants having capacity of 500 kW to 2MW to be set up by individual farmers/group of farmers/cooperatives/panchayats/Farmer Producer Organisations (FPO)/Water User Associations (WUA) in the vicinity of rural grid sub-stations under PM KUSUM Scheme introduced by the Government of India (GoI).

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2. **Brief facts of the case are presented below: -**

A. Background

A.1. That as a part of Intended Nationally Determined Contributions (INDCs) for reduction of greenhouse gas emission, India has committed to increase the share of installed capacity from non-fossil sources to 40% by 2030. The Govt. of India has accordingly scaled up the target for solar power from 20,000 MW of Grid Connected Solar Power Projects to 1, 00,000 MW by 2022. While large scale solar power generation projects are being set up to achieve the ambitious target of 1,00,000 MW of Solar Power Generation, it has been planned to simultaneously develop decentralized Solar Energy and other Renewable Energy Generation Plants of capacity upto 2MW which could be directly connected to the existing 33/11kV, 66/11kV, 110/11kV substations of the Distribution Company, thus, saving transmission system requirements apart from reduction in T&D Losses. Such plants are proposed to be set up near the substation (within 5km) in rural areas preferably by the farmers or farmers' bodies such as Panchayats, Corporative etc giving them an opportunity to increase their income by utilizing their barren land to set up solar or other renewable energy-based power plants. Cultivable land may also be used if the Solar plants are set up on stilts (raised structure) where crops can be grown below the stilts. Besides it is planned to replace the existing 10million tubewell pumps run on diesel with Solar Powered Pumps and further to solarize 20million grid connected pumps presently being supplied electricity by the Discoms.

A.2. That the Government of India, Ministry of New and Renewable Energy has accordingly formulated and launched a New Scheme for the farmers under the name Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) Scheme. The scheme will also

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give an opportunity to the farmers to increase their income. PM KUSUM scheme has the following three components: -

(i) Component-A: Setting up of 10,000 MW of Decentralized Ground/ Stilt Mounted Grid Connected Solar or other Renewable Energy based Power Plants;

(ii) Component-B: Installation of 17.50 Lakh Stand-alone Solar Agriculture Pumps; and

(iii) Component-C: Solarisation of 10 Lakh Grid Connected Agriculture Pumps.

The Operational guidelines for implementation of the scheme have been issued by MNRE, GoI vide Office Memorandum dated 22.07.2019. A copy of the Operational Guidelines as received is enclosed with the petition.

As per the guidelines, the component A will be implemented initially on pilot mode for 1000 MW capacity and Similarly, Component-C would also be implemented initially in pilot mode for one lakh grid connected agriculture pumps. Component-B will be implemented in full-fledged manner.

All the three components of the scheme aim to add Solar Capacity of 25,750MW by 2022 with total central support of Rs 34,422 Cr.

A.3. That power generated from all the Renewable Energy (RE) based power plants to be set up under Component –A of the scheme, will be purchased by the Discoms at a pre-fixed levelized tariff.

A.4. That the State Nodal Agency (SNA) i.e. HAREDA will coordinate with States, DISCOMs and farmers for implementation of the scheme. They will assist the farmers in project development activities including formulation of DPR, PPA/EPC contracts, getting funds from financial institutions, etc. As per Memo No. DRE/PO-1/2019/2972 dated

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04.09.2019, Discoms are mandated to take the following actions as mandated in the guidelines: -

i. Send demand to MNRE for sanction/allocating capacity of minimum 100MW capacity for the State under the scheme along with letter of readiness to implement Component A of the Scheme.
ii. Assess and notify RE Generation Capacity (Sub-station wise) that can be injected into all 33/11, 66/11kV sub-stations of Rural areas and place such notification on its website for information of all Stakeholders.
iii. Facilitate farmers willing to lease out land for RE plants near above notified sub-station(s), as provisions of this scheme. Discoms may also place list of such farmers on their website.
iv. Invite substation wise EoI from RPGs (Renewable Power Generator) to participate in the selection process to set up decentralized Renewable Power Plants.
v. File a Petition in HERC for determination of pre-fixed levelized tariff for purchase of RE Power from the RPGs who set up Renewable Energy Power plants (REPP) under this scheme.
vi. Nominate Commissioning Committee for implementation of the Projects.

The Discoms have already assessed substation wise RE Generation capacity that can be injected at various 33/11 kV substations in the rural areas. The total RE capacity that can be injected adds upto 59.00 MW in case of UHBVN and 76.00 MW in case of DHBVN. A copy each of the list giving transformer wise RE Capacity that can be injected for UHBVN and DHBVN is enclosed with the petition. Discoms have already sent requisition to MNRE, GoI for allocation of 135MW capacity under Component A of the Scheme.

A.5. That this Petition is being filed in compliance of requirements as at Sr. No. v above for determination of pre-fixed levelized tariff for purchase

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of RE power from the RPGs who will set up REPPs under component A of the scheme. It has been submitted that the Discom will be in a position to invite substation wise EoI from RPGs (Renewable Power Generator) to participate in the selection process to set up decentralized Renewable Power Plants only after the pre-fixed levelized tariff is determined by the Commission.

B. **Modalities of Component-A of Pradhan Mantri Kishan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) Scheme.**

The modalities for implementation of Component A of the PM KUSUM Scheme, as per the MNRE guideline are in brief as under:-

B.1. That under Component-A of PM KUSUM, solar or other renewable energy-based power plants (REPP) of capacity 500 kW to 2 MW will be setup by individual farmers/ group of farmers/ cooperatives/ panchayats/ Farmer Producer Organizations (FPO)/Water User associations (WUA) hereinafter called Renewable Power Generator (RPG). However, States/DISCOMs may allow setting-up of solar or other renewable energy-based power plants of capacity less than 500 kW in specific cases. The REPP will be preferably installed within five km radius of the sub-stations in order to avoid high cost of sub-transmission lines and to reduce transmission losses.

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The Distribution companies (DISCOMs) will assess sub-station wise surplus capacity which can be fed from such RE power plants to the Grid and shall invite applications from interested beneficiaries for setting up the renewable energy plants. The renewable power generated will be purchased by DISCOMs at a pre-fixed levelized tariff.

In case, the aggregate capacity offered by Applicants is more than notified capacity for a particular sub-station, bidding route will be followed by DISCOMs to select Renewable Power generator and in such cases the pre-fixed levelized tariff will be the ceiling tariff for bidding. Selection of bidders will be based on the lowest tariff offered in the ascending order as quoted by the bidders in the closed bid or e-reverse auction as the case may be.

A model PPA (Power Purchase Agreement) to be executed between RPG and DISCOMs has been prepared by MNRE. The duration of PPA will be 25 years from Commercial Operation Date (COD) of the project. The total energy purchased from these RE plants will be accounted for fulfilment of RPO by the DISCOM.

In case the farmers/ group of farmers/ cooperatives/ panchayats/ Farmer Producer Organizations (FPO)/ Water User associations (WUA) etc. are not able to arrange equity required for setting up the REPP, they can opt for developing the REPP through developer(s) or even through local DISCOM, which will be considered as RPG in this case. In such a case, the land owner will get lease rent as mutually agreed between the parties. The lease rent may be in terms of Rs per year per acre of land or in terms of Rs per unit energy generated per acre of land area. The farmer(s) may opt for payment of lease rent directly in their bank account by the DISCOM, from the payment due to the developer. A model Land Lease Agreement to facilitate the

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beneficiaries has also been prepared by MNRE. However, the terms of Land Lease Agreement may be finalized on mutual consent of concerned parties.

The REPP under the scheme would be implemented primarily on Barren / uncultivable land. Agricultural land is also permitted under the scheme provided that solar plants are installed in stilt fashion (i.e. raised structure for installation of Solar panels) and with adequate spacing between panel rows for ensuring that farming activity is not affected. The RPG would be free to adopt any renewable energy source or technology while responding to the bid. However, in case of cultivable land with solar plants, the same may be installed on stilts, so that the farmers continue to cultivate the land, apart from getting the benefit of lease rent. In such a case DISCOM may also float bids (in case of specific substations) where setting up of solar projects on stilts may be mandatorily required, and bids for energy tariff invited accordingly.

B.2. Selection and Implementation of Decentralized Renewable Energy Power Plants

a. Notification of sub-station wise generation capacity

DISCOM shall assess and notify RE generation capacity that can be injected in to all 33/11 kV sub-station of rural areas and place such notification on its website for information of all stakeholders. To facilitate farmers willing to lease out their land for development of RE plants near above notified substation(s), as per provisions of this scheme, DISCOM may also place list of such farmers on their website. However, the leasing of land of any farmers will be a bi-partite agreement between the farmer and the developer and DISCOM will not be held responsible for failure in getting the land leased out to a developer. To meet additional demand DISCOM will

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augment the capacity of sub-station under IPDS or any other scheme.

b. Expression of Interest (EoI) for Short-listing of RPG

DISCOM or any agency authorized by the DISCOM shall invite 33/11 kV sub-station wise EoI from RPG to participate in selection process for development of decentralized renewable power plants. The RPG shall submit their interest against the EoI as per the schedule notified by DISCOM. An RPG will not be allowed to apply for more than one renewable power plant for a particular 33/11 kV sub-station.

The DISCOM may recover non-refundable processing fee from the interested RPGs, which in no case shall be higher than Rs. 5000 per MW or part thereof of the capacity applied for.

In case of REPP being developed by a developer, the Net-Worth of the developer should not be less than Rs. 1.00 Crore per MW (of the capacity applied). This shall not be applicable for farmers' cooperative or panchayats or Farmer Producer Organizations (FPO) /Water User associations (WUA) or farmers setting up REPP in their own lands.

c. Selection of REPP

In case the total aggregate capacity of eligible applications received for a particular sub-station is less than or equal to the capacity notified for connectivity at the sub-station, LoA will be awarded to all eligible applicants for procurement of renewable power at a pre-fixed levelized tariff.

In case the total aggregate capacity of eligible application received for a particular sub-station is more than the capacity notified for connectivity at the sub-station, then DISCOM shall invite Bids from all these applicants. Selection of bidders will be based on the lowest tariff offered in the ascending order as quoted by the bidders in the closed bid or e-reverse auction as the case may be. LoA will be awarded to all successful bidders.

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d. Connectivity with the sub-station

REPP of capacity up to 2 MW may be connected at 11 kV side of substation and the selected RPG will be responsible for laying of dedicated 11 kV line from REPP to sub-station, construction of bay and related switchgear at sub-station where the plant shall be connected to the grid and metering is done.

RPG will be responsible for maintaining this dedicated line.

e. Power Purchase Agreement (PPA)

A copy of standard Power Purchase Agreement to be executed between the DISCOM and the RPG shall be provided by DISCOM along with invitation for submission of EoI. The model PPA agreement has been enclosed by the MNRE with the guidelines.

The PPA shall be for a period of 25 years from the date of COD. The DISCOM will be obliged to buy the entire power from RPG within the contract capacity. The RPG would be required to achieve a minimum CUF of 15% on annual basis during the PPA period. However, in case of low Solar radiation zones, minimum CUF can be revised by concerned DISCOM.

f. Bank Guarantees

The RPG shall provide the following Bank Guarantees to DISCOM as follows:

- Earnest Money Deposit (EMD) of Rs. 1 Lakh/MW in the form of Bank Guarantee along with EoI.
- Performance Bank Guarantee (PBG) of Rs. 5 Lakh/MW within 30 days from date of issue of Letter of Award.

The Bank Guarantees against EMD shall be returned to the selected RPG on submission of valid PBGs. The selected RPGs are required to sign PPA with the DISCOM in line with the timeline given in the Guidelines. In case, the selected RPG fails to execute the PPA within the stipulated time period, the Bank Guarantee equivalent to EMD shall be en-cashed by DISCOM as penalty.

g. Release of PBI to DISCOM

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DISCOM would be eligible to get PBI @ Rs. 0.40 per unit purchased or Rs. 6.6 lakh per MW of capacity installed, whichever is less, for a period of five years from the COD. However, to avail the PBI, DISCOM shall submit following documents after completion of one year from the COD and every year thereafter till five years:

- Timely payment of monthly lease rent, if applicable, to the land owner of the project.
- Monthly units purchased from the plant and corresponding payment made to the project developer.

B.3. The total energy purchased from these RE plants will be accounted for fulfillment of RPO by the DISCOM.

C. <u>Regarding determination of prefix levelized tariff for purchase of energy generated from Solar Plants set up under Component -A of PM KUSUM Scheme</u>

C.1. As already stated, under Component-A of PM KUSUM Scheme, Solar or Other renewable energy-based power plants of capacity 500kW to 2 MW will be set up by farmers or other bodies as detailed in the earlier section. Discoms have requisitioned for allocation of a capacity of 135MW to be set up on pilot basis. Energy generated from the Solar plants developed under the Component-A of PM KUSUM Scheme will be purchased by Petitioners at pre-fixed levelized tariff.

C.2. Regarding determination of Pre-fixed levelized tariff, the kind attention of the Hon'ble Commission is invited to the following provisions in the guidelines:-

i. The RPG shall Commission the Solar Power Plant within 9 months from the date of issuance of LOI.

ii. The CUF of the plant shall be taken as minimum 15%.

From these provisions in the guidelines, it can be inferred that the REPPs that will be set up under Component A of the PM KUSUM scheme ought to be Solar Power Plants only. Therefore, the Hon'ble Commission is required to determine pre-fixed levelized tariff at

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which power from the Solar Power Plants to be set up under Component A of the Scheme would be purchased by the DISCOM.

C.3. In this context it is further submitted that the Petitioner had recently floated Request for Proposal (RFP) under Category-II having NIT no: 77/CE/HPPC/SOLAR/300MW on 03.01.2019 for procurement of 60 MW solar power from plants having individual capacity of 1MW to 2MW. The power from the successful bidders as per the RFP was to be purchased for a period of 25 years. The lowest tariff discovered against the said RFP for 1MW to 2MW capacity solar plants was 2.999 Rs/kWh. (details enclosed with the petition) It is submitted that while quoting for setting up of solar power plants against tariff based competitive bidding, the developer takes cognizance and keeps in view all cost factors and other relevant parameters. Therefore, the tariff of Rs 2.999 per kWh is the last discovered levelized tariff emerged based on competitive tariff-based bidding.

C.4. As already stated, the energy generated from the solar plants established under Component-A of PM KUSUM is to be purchased by the Petitioners at a pre-fixed levelized tariff, therefore in this regard it is requested that the Hon'ble Commission may kindly allow the last discovered tariff of Rs 2.999 per kWh as the pre-fixed levelized tariff for purchase energy by the Petitioners from RGPs who will set up solar power plants under the Component-A of the PM KUSUM Scheme.

C.5. The matter as above is submitted for kind consideration of the Hon'ble Commission and necessary directions on the same.

D. That the petitioner has made the following prayers:

a) To kindly approve the pre-fixed levelized tariff at Rs. 2.999/kWh for procurement of energy from the solar plants to be installed under Component-A of PM KUSUM Scheme.

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b) Condone any inadvertent omissions/errors/shortcomings and permit the Petitioner to add/change/modify/alter this filing and make further submissions as may be required.

c) Pass such Order, as the Hon'ble Commission may deem fit and appropriate keeping in view the facts and circumstances of the case submitted by the Petitioner.

Proceedings in the Case

3. The Commission heard the case on 18.12.2019 where the representatives of the petitioner and HAREDA were present. The petitioner reiterated the written submissions, which, for the sake of brevity, are not reproduced herein.

4. **Commission's Analysis and Order**

At the onset it is made clear that the Commission, in the present Order, is carrying out limited exercise for determination of levelized tariff for purchase of power by Discoms from decentralized Solar Power Plants and other Renewable Energy Generation Plants having capacity of 500 kW to 2MW to be set up by individual farmers/group of farmers/cooperatives/panchayats/Farmer Producer Organizations (FPO) /Water User Associations (WUA) in the vicinity of rural grid sub-stations under Component-A of the Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) Scheme introduced by Government of India (GoI). Hence, the levelized tariff determined herein shall be subject to all the terms and conditions of the ibid scheme.

The HERC RE Regulations in vogue provides that the norms including Capital Cost, CUF, Auxiliary Energy consumption, O&M expenses shall be determined on the basis of prevalent market trend. The broad guidelines of the relevant regulations are as under: -

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*48. **Capacity Utilisation Factor**. – The Capacity utilisation factor for Solar PV project shall be 19%. Provided that the Commission may deviate from above norm in case of project specific tariff determination.*

*49. **Operation and Maintenance Expenses.** –*

(1) The O&M Expenses shall be determined based on prevalent market conditions.

(2) Normative O&M expenses allowed at the commencement of the Control Period under these Regulations shall be escalated at the rate of 5.72% per annum.

*50. **Auxiliary Energy Consumption.** – The auxiliary energy consumption shall be 0.25% of the gross generation.*

The Commissions has perused the aforesaid regulations and observes that with advancement in technology and continuous improvement in the efficiency of the solar modules including capability to generate power even in diffused sunlight, the CUF has also witnessed improvement. Hence, for the limited purpose of working out levelized tariff in the present Order, the Commission has considered CUF of 20%.

Further, the normative O&M has been considered at Rs. 10 Lakhs / MW with an annual escalation factor of 5.72% in line with the HERC Regulations for the solar power projects to be set up under KUSUM. Auxiliary Energy Consumption has been pegged at 0.25% as per the HERC Regulations. Return on normative equity (debt – equity ratio as per HERC RE Regulations is 70:30) has been pegged at 14% in line with the HERC RE Regulations.

Interest cost on term loan has been considered at MCLR + 200 basis points and for normative working capital the interest rate has been pegged at MCLR + 100 basis point. Accordingly, Weighted Average Cost of Capital (WACC) to be used as the discounting factor for arriving at the levelized tariff in the present case, has been computed as 14 (RoE) * 0.3 (Equity Component) + 10.31

(Interest on Term Loan) * 0.70 (Debt Component). Accordingly, WACC has been estimated at 11.42%.

The Commission observes that the most important parameter impacting the levelized tariff is the project cost which as per HERC RE Regulations has to be aligned with the market trend. In the past when this Commission determined tariff for solar power projects, the said cost was estimated on the basis of international price at the prevalent INR : USD exchange rate. However, as of now good quality solar module manufacturing capacities have come up in India as well and the same is available at a competitive rate. Hence, under 'Make in India' campaign the same needs to be promoted.

The Commission has perused pre-fixed levelized tariff determined by a few SERCs in India. The Ld. SERC of Rajasthan vide its Order dated 06.09.2019 (draft Order) has considered Capital Cost of Rs. 3.40 Crore / MW largely based on the Solar Tariff notified by the Ld. SERCs of Karnataka and Tamil Nadu for the FY 2019-20. The Ld. KERC has considered Capital Cost of Rs. 3.40 Crore / MW while SERCs of Tamil Nadu has considered Capital Cost of Rs. 3.35 Crore / MW.

The Commission is of the considered view that the Capital Cost of such projects especially cost of modules, inverter and civil work may not vary significantly across the country. Further, as the relevant Orders of the Ld. KERC and Ld. RERC are more recent, the Commission has accordingly pegged the Capital Cost, for the limited purpose of the present Order at Rs. 3.40 Crore / MW.

Additionally, the Commission observes that the Discoms have prayed that this Commission may allow a pre-fixed leveled tariff of Rs. 2.999 / kWh i.e. the lowest tariff discovered by way of NIT dated 03.01.2019. The Commission has considered the submission and also the relevant Annexures of the present petition and observes that the said price was offered by a single bidder only. Hence, the said rate cannot be construed as competitive and used as a

benchmark due to the fact that the single bidder may be having some specific comparative advantageous that ought not to be generalized.

In view of the above discussions, the Commission has proceeded to determine the levelized tariff based on the following parameters: -

1	Useful Life / Tariff Period	25 years
2	Capital Cost (Rs. Crore / MW)	3.40
3	(CUF %)	20%
4	Auxiliary Energy Consumption (%)	0.25%
5	RoE	14%
6	Interest on Term Loan (MCLR + 2%)	10.31%
7	Interest on Normative Working capital (MCLR + 1%)	9.31%
8	O&M	Rs. 0.105 Crore /MW escalated at the rate of 5.72% per annum thereafter
9	Deprecation on 90% of the Project Cost, 10% being the residual value	3.6% (SLM 90 / 25)
10	Discounting Factor	11.42%

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Based on the aforesaid parameters, the Commission determines levelized tariff at Rs. 3.11 / kWh for entire life of the project. The computational details are placed at **Annexure – A.**

In terms of the above, the present petition is disposed of.

This Order is signed, dated and issued by the Haryana Electricity Regulatory Commission on 20th December, 2019.

Date: 20.12.2019	**(Naresh Sardana)**	**(Pravindra Singh)**	**(D.S. Dhesi)**
Place: Panchkula	**Member**	**Member**	**Chairman**

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HERC Solar PV Projects (under Kusum)					ANNEXURE A																					
Table of parameters																										
Capital cost (Rs in Million / MW)	34.00																									
Residual value (10%) Rs Million	3.40																									
Total depreciation (Rs. Million)	30.6																									
Loan component (70%) Rs. Million	23.80																									
Equity component (30%) Rs. Million	10.20																									
CUF (%)	20%																									
O&M (Rs. Million / MW)	1.05																									
O&M escalation	5.72%																									
Depreciation (1st 10 years)	3.60%																									
ROE (1st 10 years)	14%																									
ROE (11th year onwards)	14%																									
Income tax																										
Interest on term loan	10.31%																									
Interest on working capital	9.31%																									
Discount rate	11.42%																									
Levellised tariff (Rs /kWh)	3.11																									
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
O&M escalation	1.05	1.11	1.17	1.24	1.31	1.39	1.47	1.55	1.64	1.73	1.83	1.94	2.05	2.16	2.29	2.42	2.56	2.70	2.86	3.02	3.19	3.38	3.57	3.77	3.99	
Outstanding Loan amount	23.80	21.42	19.04	16.66	14.28	11.90	9.52	7.14	4.76	2.38																
Loan repayment	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38																
Interest on loan	2.33	2.09	1.84	1.59	1.35	1.10	0.86	0.61	0.37	0.12																
Working capital																										
One month O&M	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.25	0.27	0.28	0.30	0.31	0.33	
2 Months receivables	1.03	0.99	0.96	0.93	0.90	0.88	0.85	0.82	0.79	0.77	0.77	0.78	0.80	0.82	0.84	0.87	0.89	0.92	0.94	0.97	1.00	1.03	1.07	1.10	1.14	
Maintenance spares15% of O&M	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.25	0.26	0.27	0.29	0.31	0.32	0.34	0.36	0.38	0.41	0.43	0.45	0.48	0.51	0.54	0.57	0.60	
Total	1.27	1.25	1.24	1.22	1.21	1.20	1.19	1.18	1.18	1.17	1.19	1.24	1.28	1.33	1.38	1.43	1.49	1.55	1.61	1.68	1.75	1.82	1.90	1.98	2.07	
Interest on working capital	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.16	0.16	0.17	0.18	0.18	0.19	
Particulars	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
Capacity (MW)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	26
Generation (Million Units)	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	43.8
Aux Energy Cons (%)	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	
Generation (Ex-bus Million Units)	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	1.7476	43.7
Fixed Costs																										
O&M Expenses	1.05	1.11	1.17	1.24	1.31	1.39	1.47	1.55	1.64	1.73	1.83	1.94	2.05	2.16	2.29	2.42	2.56	2.70	2.86	3.02	3.19	3.38	3.57	3.77	3.99	55.4
Depreciation	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	30.6
Interest on Term Loan	2.33	2.09	1.84	1.59	1.35	1.10	0.86	0.61	0.37	0.12	0.00	0.00	0.00													12.3
Interest on Working Capital	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.16	0.16	0.17	0.18	0.18	0.19	3.3
Return on Equity	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	35.7
Income tax on ROE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Fixed Cost (Rs. Mln)	6.15	5.96	5.78	5.60	5.43	5.25	5.09	4.93	4.77	4.62	4.59	4.70	4.82	4.94	5.07	5.20	5.35	5.50	5.66	5.83	6.01	6.20	6.40	6.61	6.83	137.3
Tariff (Rs/kWh)	3.52	3.41	3.31	3.21	3.10	3.01	2.91	2.82	2.73	2.64	2.63	2.69	2.76	2.83	2.90	2.98	3.06	3.15	3.24	3.34	3.44	3.55	3.66	3.78	3.91	78.6
Per unit tariff components																										
Per unit O&M Expenses	0.60	0.64	0.67	0.71	0.75	0.79	0.84	0.89	0.94	0.99	1.05	1.11	1.17	1.24	1.31	1.38	1.46	1.55	1.64	1.73	1.83	1.93	2.04	2.16	2.28	31.7
Per Unit Depreciation	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	17.5
Per Unit Interest on term loan	1.33	1.19	1.05	0.91	0.77	0.63	0.49	0.35	0.21	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.0
Per Unit Interest on working capital	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.11	1.9
Per Unit Return on equity	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	20.4
Per unit Income tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Levellised tariff computation																										
Discount factor	1.00	0.90	0.81	0.72	0.65	0.58	0.52	0.47	0.42	0.38	0.34	0.30	0.27	0.25	0.22	0.20	0.18	0.16	0.14	0.13	0.12	0.10	0.09	0.08	0.07	9.1
Discounted tariff components(fixed)	3.52	3.06	2.66	2.32	2.01	1.75	1.52	1.32	1.15	1.00	0.89	0.82	0.75	0.69	0.64	0.59	0.54	0.50	0.46	0.43	0.40	0.37	0.34	0.31	0.29	28.3
Levellised tariff	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11	

Annexure-D

STAFF PAPER

Determination/ Fixation of levellised generic Tariff for various Renewable Energy Technologies / Projects for FY 2018-19

The Central Electricity Regulatory Commission, vide Notification dated 17.04.2017 notified CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017 (CERC RE Regulations, 2017). These Regulations are effective from 01.04.2017 after the control period of five years of the CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 (CERC RE Regulations, 2012) expired on 31.03.2017 and shall remain in force for a period of 3 years from the date of commencement i.e. upto 31.03.2020. These Regulations shall continue to remain applicable until notification of the revised Regulations, for which the exercise shall be initiated six months prior to the expiry of these Regulations. The tariff determined under these Regulations for the RE Projects commissioned during the control period shall continue to be applicable for the entire duration of the Tariff Period as specified in the Regulations. Further, CERC vide Order dated 31.05.2017 determined levelised generic tariff for FY 2017-18. The Commission vide Order dated 31.10.2017 in petition no. 50 of 2017 (Suo-Motu) adopted the CERC RE Regulations, 2017 and levelised generic tariff as determined by CERC for FY 2017-18. The orders issued for determination of levelised generic tariff for the previous years by PSERC are available at PSERC website i.e. www.pserc.in.

2. CERC in petition no. 02/SM/2018 (Suo-Motu) determined the levellised generic tariff for RE Projects for FY 2018-19 vide its Order dated 28.03.2018. CERC RE Regulations, 2017 and its aforementioned Order dated 28.03.2018 are available on the CERC website www.cercind.gov.in.

Keeping in view the above, the staff paper has been prepared for determination of the levellised generic tariff for RE projects for FY 2018-19.

3. CERC, after the due process, determined State specific levellised generic tariff for different types of RE projects for FY 2018-19 as per the norms/

parameters specified in CERC RE Regulations, 2017 which stipulate State specific norms/ parameters.

i) The salient norms / parameters as specified in CERC RE Regulations, 2017 which are common to all the States including Punjab are as under:

a) PLF of Biomass, Biomass Gasifier and Biogas projects

Renewable Energy Projects	PLF
(A) Biomass	
a) During stabilization (6 months)	60%
b) During remaining period of the first year	70%
c) Second year onwards	80%
(B) Biomass Gasifier	85%
(C) Biogas	90%

b) Capital Cost of RE Projects

Renewable Energy Projects	FY 2018-19 (₹ Lakh/MW)
1. Biomass based Power Projects	
i) Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser	559.03
ii) Project [other than rice straw and juliflora (plantation) based project] with air cooled condenser	600.44
iii) For rice straw and juliflora (plantation) based project with water cooled condenser	610.80
iv) For rice straw and juliflora (plantation) based project with air cooled condenser	652.20
2. Non-fossil fuel based Co-generation Projects	492.50
3. Biomass Gasifier Power Projects (after taking into account capital subsidy of ₹ 150 lakh/MW)	442.88
4. Biogas based Power Projects (after taking into account capital subsidy of ₹ 300 lakh/MW)	885.76

c) Debt Equity Ratio

Renewable Energy Projects	FY 2018-19	
	Debt (Rs. Lakh)	Equity (Rs. Lakh)
1. Small Hydro		
i) Small Hydro Power Projects below 5 MW	545.30	233.70
ii) Small Hydro Power Projects 5 MW to 25 MW	494.90	212.10

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Renewable Energy Projects	FY 2018-19	
2. Biomass		
i) Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser	391.32	167.71
ii) Project [other than rice straw and juliflora (plantation) based project] with air cooled condenser	420.31	180.13
iii) For rice straw and juliflora (plantation) based project with water cooled condenser	427.56	183.24
iv) For rice straw and juliflora (plantation) based project with air cooled condenser	456.54	195.66
3. Non-fossil fuel based Co-generation Projects	344.75	147.75
4. Biomass Gasifier Power Projects	310.02	132.87
5. Biogas based Power Projects	620.04	265.73

d) O&M Expenses

Renewable Energy Projects	FY 2018-19* (₹ Lakh/MW)
Biomass based Power Projects	42.29
Non-fossil fuel based Co-generation Projects	22.34
Biomass Gasifier Power Projects	55.85
Biogas based Power Projects	55.85

*Fuel cost of FY 2017-18 escalated by 5.72% per annum.

e) Auxiliary Power Consumption

Renewable Energy Project	Auxiliary Consumption Factor
Small Hydro	1%
Biomass Projects	
a) using water cooled condenser	i. During first year of operation: 11% ii. From 2nd year onwards : 10%
b) using air cooled condenser	i. During first year of operation: 13% ii. From 2nd year onwards : 12%
Non-fossil fuel co-generation	8.5%
Biomass Gasifier	10%
Biogas	12%

f) Station Heat Rate

Renewable Energy Projects	SHR (kCal / kWh)
Biomass	a. 4200 : for project using travelling grate boilers; b. 4125 : for project using AFBC boilers
Non-fossil fuel co-generation (for power component)	3600

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g) Calorific Value of the Fuel

Renewable Energy Projects	Calorific Value (kCal /kg)
Biomass	3100
Non-fossil fuel co-generation (for power component)	2250 (for bagasse)

h) Useful Life of Renewable Energy Projects

Renewable Energy Projects	Years
Small Hydro	35
Biomass power project with Rankine Cycle technology	20
Non-fossil fuel based co-generation	20
Biomass Gasifier	20
Biogas	20

ii) Following norms/ parameters are specified in CERC RE Regulations, 2017 in respect of various States. However, these norms/ parameters applicable for State of Punjab are as under:

a) Fuel Cost for RE Projects

Renewable Energy Projects	FY 2018-19* (₹ /MT)
Biomass fuel price for Biomass based Power Projects	3591.59
Bagasse price for Non-fossil fuel based Co-generation Projects	2132.01
Biomass fuel price for Biomass Gasifier Power Projects	3591.59
Fuel price for Biogas based Power Projects	1290.16

*Fuel cost of FY 2017-18 escalated by 5% per annum.

b) Capacity Utilization Factor (CUF)
(Small Hydro Power Project) : 30%

c) Capital Cost
(Small Hydro Power Project)

a. Below 5 MW : Rs. 779 lakh/ MW

b. 5 MW to 25 MW : Rs. 707 lakh/ MW

d) O&M Expenses :
(Small Hydro Power Project)

a. Below 5 MW : Rs. 30.66 lakh/ MW
b. 5 MW to 25 MW : Rs. 22.20 lakh/ MW

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e) **Plant Load Factor (PLF)**

Non-fossil fuel co-generation projects : 53%

{CERC has taken the PLF as 53% for the State of Punjab considering the load factor 92% and the operation period as 210 days [150 days (crushing) + 60 days (off season)]}.

Determination of Project Specific Tariff

For technologies such as Solar PV, Solar Thermal, Wind, MSW and RDF based projects, project specific tariff shall be determined as provided under sub-Regulation (2) & (3) of Regulation 8 of the CERC RE Regulations, 2017 which were adopted by PSERC vide Order dated 31.10.2017 in petition no. 50 of 2017 (Suo-Motu). These Regulations provide as under:

> *"8. Petition and proceedings for determination of tariff*
>
> .....
>
> *(2) A petition for determination of project specific tariff shall be accompanied by such fee as may be determined by regulations and shall be accompanied by:*
>
> *a) Information in forms 1.1, 1.2, 2.1 and 2.2 as the case may be, and as appended in these regulations;*
>
> *b) Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan etc.*
>
> *c) A statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.*
>
> *d) A statement containing full details of calculation of any subsidy and incentive received, due or assumed to be due from the Central Government and /or State Government. This statement shall also include the proposed tariff calculated without consideration of the subsidy and incentive.*
>
> *e) Any other information that the Commission requires the petitioner to submit.*
>
> *(3) The proceedings for determination of tariff shall be in accordance with the Conduct of Business Regulations".*

Keeping the above in view, it is proposed to consider the adoption of the levellised generic tariff for RE Projects for FY 2018-19 as determined by CERC in its Order dated 28.03.2018 in Petition no. 02/SM/2018 (Suo-Motu). In that case, the levellised generic tariff, as determined by CERC for the State of Punjab, for various RE Technologies i.e. Biomass based Power Projects, Biomass Gasifier

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Power Projects, Biogas based Power Projects, Small Hydro Power Projects and Non-Fossil fuel based Co-Generation Projects shall become applicable. For other technologies such as Solar PV, Solar Thermal, Wind, MSW and RDF based projects, project specific tariff shall be determined as provided in the CERC RE Regulations, 2017.

4. Accordingly, the generic tariffs for the various RE Projects/ Technologies to be commissioned during the year 2018-19 are proposed as below:

Generic Tariff for RE technologies for FY 2018-19*

Particulars				Levellised Total Tariff (FY 2018-19) (₹/kWh)
Small Hydro Power Projects				
Below 5 MW				6.05
5 to 25 MW				5.07
Levellised Fixed Cost (₹/kWh)	**Variable Cost (FY 2018-19) (₹/kWh)**	**Applicable Tariff Rate (FY 2018-19) (₹/kWh)**	**Benefit of Accelerated Depreciation, if availed (₹/kWh)**	**Net Levellised Tariff Rate upon adjusting for Accelerated Depreciation benefit (3-4) (₹/kWh)**
1	2	3	4	5
Biomass Power Projects [other than Rice Straw and Juliflora (plantation) based project] with water cooled condenser and travelling grate boiler				
2.78	5.47	8.25	0.11	8.14
Biomass Power Projects [other than Rice Straw and Juliflora (plantation) based project] with air cooled condenser and travelling grate boiler				
2.93	5.59	8.52	0.12	8.40
Biomass Power Projects [Rice Straw and Juliflora (plantation) based project] with water cooled condenser and travelling grate boiler				
2.89	5.47	8.36	0.12	8.23
Biomass Power Projects [Rice Straw and Juliflora (plantation) based project] with air cooled condenser and travelling grate boiler				
3.05	5.59	8.64	0.13	8.51
Biomass Power Projects [other than Rice Straw and Juliflora (plantation) based project] with water cooled condenser and AFBC boiler				
2.77	5.37	8.14	0.11	8.03

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Biomass Power Projects [other than Rice Straw and Juliflora (plantation) based project] with air cooled condenser and AFBC boiler				
2.92	5.49	8.42	0.12	8.29
Biomass Power Projects [Rice Straw and Juliflora (plantation) based project] with water cooled condenser and AFBC boiler				
2.88	5.37	8.25	0.12	8.13
Biomass Power Projects [Rice Straw and Juliflora (plantation) based project] with air cooled condenser and AFBC boiler				
3.04	5.49	8.54	0.13	8.40
Bagasse based Co-Generation Projects				
2.75	3.73	6.48	0.15	6.33
Biomass Gasifier Power Projects				
2.65	4.99	7.64	0.08	7.55
Biogas based Power Projects				
3.40	4.40	7.79	0.19	7.60

* As per CERC order dated 28.03.2018 in Petition no. 02/SM/2018 (Suo-Motu)

5. The revised Tariff Policy notified by the Ministry of Power on 28.01.2016 provides under clause 6.4(2) as under:

> *"States shall endeavor to procure power from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government.*
> *However, till such notification, any such procurement of power from renewable energy sources projects, may be done under Section 62 of the Electricity Act, 2003....."*

In this regard, it is brought out that Para 6.4 (2) of the Tariff Policy notified on 06.01.2006 provided that procurement of electricity from renewable sources of energy for future requirements shall be done, as far as possible, through competitive bidding under section 63 of the Electricity Act, 2003. The Commission in its earlier Orders for determination of tariff for RE projects for previous years held that till such time tariff based competitive bidding is resorted to, bidding may be carried out on the basis of discount to be offered by the prospective bidders on the generic tariffs determined by the Commission, which would be the maximum/ceiling tariff for the purpose. It is proposed that the same may continue in the interest of competitive tariffs for RE projects.