

Business Models for Solarisation of Grid-connected Agriculture Pumps

I. Business Model - Haryana:

All 468 grid connected agriculture electricity consumers of two feeders are proposed to be solarised through BLDC solar water pumps. The entire cost for replacement of pump will be borne by State Government. Being BLDC pump there will be no drawl from grid and pump will run only through solar power. When the pump is not in operation, the solar power will be injected in to the grid through inverter and the Discom will purchased this power at a rate of Re. 1/- per unit. In this model there will be saving to Discom/state on two accounts (i) saving in subsidy to agriculture consumers, which is at present is around Rs. 7.10 per unit in the state of Haryana (ii) Discom will get cheaper solar power at Re. 1/- per unit against APPC rate of Rs. 3.89 per unit. Farmer will get benefitted through availability of day time solar power and additional income by selling solar power, which would be over Rs.900 per HP per annum. Farmer will also be incentivised for using efficient irrigation techniques as less use of solar power will give him more income. The simple payback period for the investment made by the state is worked out as 8.7 years.

For more details please see Haryana Electricity Regulatory Commission Order: HERC/PRO – 38 of 2019 dated 17.9.2019 available at <https://herc.gov.in/WriteReadData/Orders/O20190917.pdf>

The rate of solar pump considered by HERC is Rs. 80,000/- per HP, however, with latest cost discovered/MNRE benchmark cost of Rs. 55,000/- per HP the simple payback works out to be 6 years. Further, if the entire expenditure for replacement of pumps is taken as loan from any Financial Institution at an interest rate of 8%, with an EMI equivalent to savings, the loan will be repaid over a period of 8 years.

II. Business Model - Gujarat:

The government of Gujarat implementing Suryashakti Kisan Yojana (SKY) for solarization of grid connected agriculture pump-sets. Under the scheme individual farmer having grid connected agriculture pump-set is provided with solar panels of capacity equivalent to 1.25 times of the capacity the of the pump in HP e.g. 10 HP capacity pump will be provided with 12.5 kW solar capacity. The cost of solarization is divided into three components, the state government will provide capital subsidy 30%, loan from NABARD 65%, and balance 5% as farmer contribution. The NABARD loan is available at 6% interest rate to be repaid in 7 years. Farmer can draw power from the grid and can inject solar power into the grid. For the solar power injected into the grid the farmer will get Rs. 3.5 per unit from the Distribution Company for the 25 years and additionally Rs. 3.5 per unit as evacuation based incentive from the state government for the first seven years. The loan from NABARD is serviced from the payment of solar power injected into the grid on net metering basis. In case the payment for net solar power injected in to the grid is more than instalment of NABARD loan the balance amount is credited in to the farmers account. The Discom will get solar power at APPC of Rs. 3.50 for next 25 years without any escalation and also save on account of reduced T&D losses. The state Government will save subsidy of Rs. 5.4 per unit. Farmer will be the benefitted by availability of day time reliable power and income from sale of net solar power injected, which may go over Rs. 4000 per HP per annum after payment of NABARD loan. The simple payback period is around 10 years in this case.

For more details please see:

Gujarat Electricity Regulatory Commission Order dated 29.10.2019 against Petition No. 1729 of 2018 available at <https://www.gercin.org/wp-content/uploads/document/ff63d6db-6d15-451a-9604-c838fbf06f0a.pdf>

SKY Scheme available at <http://www.ugvcl.com/solarrooftop/SKY%20Scheme%20G.R..pdf>

III. **Business Model - Maharashtra:**

The state of Maharashtra is implementing “Chief Minister Solar Agriculture Feeder Scheme” under which centralised solar power plant will be installed at agriculture feeder level. With APPC of Rs. 4/- per unit and corresponding transmission charges and T&D losses the cost of power at feeder level is around Rs. 4.85 per unit.

For agriculture feeder with connected load of 2500 HP the annual energy requirement would be 2.47 MUs assuming 1250 hrs of pump operation during a year. With conventional grid power the cost of this energy would be Rs. 1.2 Cr per year and there will be yearly escalation. If the feeder is supplied through solar power plant installed at the feeder level the solar power would be available at fix rate of Rs. 3/- per unit for 25 years and total cost of solar power for the feeder will be Rs. 0.74 Cr per year thus saving of around Rs. 0.46 Cr per year. The NPV of saving will be around Rs. 5 Cr,

In this case farmer is benefitted by day time reliable solar power, State Government will save on reduced burden on subsidy and for Discom there will be saving on two accounts, (i) reduced subsidy requirement; and (ii) availability of low cost surplus solar power at tail end which can be supplied to nearby rural load thus saving on power cost and T&D losses.

For more details please see:

<https://www.maharashtra.gov.in/site/Upload/Government%20Resolutions/Marathi/201802271220264910.pdf>

<https://www.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201803171221136410.pdf>

MERC order dated 9.1.2018 in case No. 164 of 2017 available at <https://www.merc.gov.in/faces/merc/common/outputClient.xhtml>

Annexure-II

Clarifications and suggestions on implementation of Phase-II of Rooftop Solar Programme being implemented through Power Distributing Companies

Central Government had approved Phase-II of Rooftop Solar (RTS) Programme in February 2019 with an objective to achieve 40 GW of Grid Connected Rooftop Solar by the year 2022. In Phase-II of RTS Programme, Power Distributing Companies (DISCOMs) have been made the implementing agencies as consumers have easy access to DISCOMs. Thereafter, Ministry of New and Renewable Energy (MNRE) issued the operational guidelines for implementation of Phase-II of RTS Programme on 20th August 2020 and have been regularly pursuing with the State Government and DISCOMs. DO letters from Secretary, MNRE and Hon'ble Minister, NRE to their counterparts in the States, workshop for DISCOMs, sharing model procedure with the States in the Power Minister's conference held on 11-12th October 2019 and review meetings at Secretary level are some of the steps taken by MNRE for roll out of Phase-II of RTS. On the basis of feedback received from the stakeholders including the general public following clarifications and suggestions are reiterated for adoption of the State Governments and DISCOMs:

- I. DISCOMs have been made the implementing agencies as consumers have easy access and vice versa. Initially DISCOMs have been given an option to take the assistance of State Nodal Agencies (SNAs) as these might not have the expertise for implementation of the Programme. Although DISCOMs are at liberty to take the assistance of SNAs but they have to be on forefront for implementation of the Programme. MNRE will communicate only with the DISCOMs only for all the activities which include sanctioning of the capacity, release of funds, review of the implementation of the Programme etc.
- II. Development of dedicated online portal where a consumer can apply and all the approvals can be given timely with transparency and its integration with the SPIN portal of MNRE is one of the responsibility of DISCOMs. Earlier such portal was available with most of the SNAs. State Government/DISCOMs may either create separate portal or adopt the existing portal of SNAs with required modifications. As all the financial approvals in MNRE are processed on the basis of data available in SPIN portal, therefore, it is imperative for the DISCOMs to immediately develop the portal and link it with the SPIN Portal of MNRE. Technical assistance is already being provided to the DISCOMs for this purpose. MNRE may not be in a position to sanction any capacity and release any funds to the DISCOMs in the absence of the Portal of the DISCOMs.
- III. Consumer awareness and publicity is primary requirement for the success of any programme. DISCOMs are expected to carry out consumer awareness and publicity drive for the success of the programme. MNRE will share the template for the publicity drive shortly which may be used by the DISCOMs after necessary changes which may be necessary at local level.
- IV. Suggestive operating procedure with timeline was provided in the operational guidelines issued by MNRE on 20th August 2019 and the same was further modified on the basis of feedback received from the stakeholders so that it is more consumer friendly. Modified suggestive operating procedure has been shared with the State Governments/DISCOMs in various communications. The suggestive operating procedure is attached again as **Appendix-I** for ready reference and it is reiterated that application form for applying for the RTS should be as simple as possible.
- V. In the suggestive operative procedure, it was indicated that the consumer should pay the balance of subsidy amount to the empanelled vendor after signing of the metering agreement. However, on the basis of the feedback received it is suggested that fifty percent of the balance of subsidy amount may be paid by the consumer to the DISCOM and balance fifty percent after commissioning of the RTS. DISCOM can pay the full amount to the empanelled vendor after

inspection of RTS and satisfaction of the consumer. This arrangement is suggested to safeguard the interest of the consumers.

- VI. Ministry has received feedback from some of the stakeholders that State Electricity Regulatory Commissions (SERCs) on the proposals/petitions from the DISCOMs fix the feed in tariff under Gross Metering regulations that it becomes unattractive for a consumer to go for the Rooftop Solar. This is not good not only for the Renewable Energy Sector, but for the DISCOMs too as these will not be able to meet its RPO obligation. It is, therefore, suggested that while making a proposal/petition to the SERC for fixing feed in tariff under Gross Metering Regulation, the proposed tariff should be such that a consumer who has installed the Rooftop Solar should get an annual return of around 16%, so that his capital cost is recovered in 5-6 years' time. This will motivate the consumers to go for the Rooftop Solar and DISCOMs will be benefited by getting RE at reasonable rates, which will facilitate them to fulfil their RPO obligations.
- VII. It has been observed that some of the implementing agencies while empanelling the vendors/agencies selected through transparent bidding process have empanelled the vendors/agencies on their quoted rates without asking them to match the L1 rates. Similarly, some agencies while empanelling the vendors/agencies have given an option to the vendors/agencies to charge more than the discovered L1 rates in the name of better quality and location of the installation. It is clarified that no vendor/agency should be empanelled without the consent of providing the services at L1 rates. Similarly, no vendor/agency should be given the liberty to charge more than the L1 rate in the name of better quality as the quality standard must have been provided in the bidding documents as per MNRE guidelines. If, any higher rates due to location of the installation have been provisioned as per the bidding documents then the same may be clearly indicated while declaring the exact higher rates along with the specifications on the basis of which higher rates have been allowed. For example, installation of RTS in hilly area or installation of RTS on elevated structure with the specifications of height and other technical specifications for the material to be used for providing elevated structure.
- VIII. During the course of interactive discussions and review of the programme with the implementing agencies four innovative practices/models have been presented by different DISCOMs and appreciated by the other implementing agencies. These innovative practices/Business Models are attached as Appendix-II for the information and benefit of all the implementing agencies.

Appendix-I**Suggestive Model Operating Procedures with timelines for Installation and Metering Connection of Grid Connected Solar Rooftop PV Systems by DISCOMs**

ACTIVITY	RESPONSIBILITY	TIMELINE (Max Working Days)
Submission of Application by consumer on portal/ offline at notified centres along with token fee of Rs 500/- (to cover inspection and estimate preparation charges)##	CONSUMER	Zero Date
Acknowledgment of Application by DISCOM	DISCOM	Same Day
Uploading of the offline application on the portal by the DISCOM	DISCOM	2
Site Verification / Technical Feasibility/ estimate by Empaneled Vendor of the choice of the consumer and submission of the same to Discom by the Vendor	Empaneled Vendor	10
Letter of Approval (LOA), Approval of estimate and sanctioned CFA, if eligible. Aadhar seeding of the beneficiary and handing over/ mailing of Metering Agreement form to Consumer	DISCOM	10
Execution of Metering Agreement	DISCOM & CONSUMER	5
Payment of 50% of balance amount payable by consumer (excluding bank loan applied for and eligible CFA) to DISCOM (online or through cheque / draft)	CONSUMER	Same Day
Message to be received by bank for sanction of loan, if consumer has opted for loan	SYSTEM	Same Day
Installation of Rooftop Solar System, Submit Work Completion Report / Certificate and intimation of meter procurement intimation (If not provided by Discom)	Empaneled Vendor	30-90 (Depending on CAPACITY)
Inspection by CEIG (if applicable) *	CEIG	15
Issuance of Safety Certificate *	CEIG (if applicable)	5
Inspection by DISCOM, Installation of Meter and Commissioning & synchronization of the System with Grid	DISCOM	15 (after CEIG approval, if required or after submission of the completion report if CEIG inspection not required)

Release of balance 50% payment (Deducting the CFA) by consumer/bank to the vendor	Consumer	Same Day
Release of CFA and full payment to Vendor by the DISCOM	DISCOM	30
Billing Process	DISCOM	From the next billing cycle after commissioning

Application form should be simple and should require minimum information as DISCOMs must be having most of the details of the consumer

- Most of the States have exempted the CEIG inspection for smaller system of 10 KW, therefore, all the States/UTs may follow this practice
- Max Time required for the whole process: **75 to 150 Days (2.5 to 5 Months)** after the consumer submits his request

** Payment of CFA to the Vendor by DISCOM can be made from the advance. MNRE will release advance/subsequent payment within 21 days of receipt of request from the DISCOM with requisite papers.

Innovative Practices/Business Models adopted by the DISCOMs (Implementing Agencies) in the implementation of the Phase-II of Rooftop Solar Programme

I. Innovative RESCO Model for Residential Sector by Chandigarh Electricity Department

Under RESCO Model, capital investment is made by the Solar Developer who signs a Power Purchase Agreement with the owner of the premises where Rooftop solar plant has been installed for purchasing of the power at an agreed tariff. This tariff is much lower than the tariff charged by the DISCOMs for their regular supply. RESCO operators are interested in plants of higher capacity, generally of 50 kW and more. Therefore, for the residential sector, RESCO operators are not interested. Chandigarh Electricity Department has planned RESCO Model for residential sector by aggregating the demand of high power consuming residential households and plan to implement in the following manner:

- High Power Consuming Residential Consumers (2000-2500 in number) in residential sectors of Chandigarh targeted for 5-10 kW capacity each
- RESCO Developers to be selected through bidding with a cap for the tariff at Rs.3.37 which is the Average Power Purchase cost of the Electricity Department. Regulator has approved this rate.
- Consumers will get solar electricity @ Rs.3.30 for the 15 years and after 15 years system will be transferred to the consumers
- RESCO Developer will get money from the electricity generated from DISCOM at the discovered rate which will be Rs.3.37 or less
- Consumer will get maintenance free, capital cost free RTS for 15 years and after 15 years' system will be transferred to the consumer
- DISCOM will get benefit of cheaper power during peak demand of office hour in summer season and also benefit or RE in RPO Compliance

II. Innovative Loan facilitation by AP Eastern Power Distributing Company Ltd

Residential consumers with lower income group generally finds it difficult to spare money required for the installation of the Rooftop. It is also difficult task for them to get the loan approved from the banks/financial institutions for the installation of Rooftop. Andhra Pradesh Eastern Power Distribution company Ltd (APEPDCL) has tie up with the Andhra Bank for providing loan to the residential consumers for installation of Rooftop Solar. APEPDCL works in the following manner:

- Low Power Consuming Residential Consumers with monthly consumption of 100-150 kWh targeted for 1 kW capacity each
- DISCOM tie up with the Andhra Bank for providing loan for such consumers
- EMI for the loan availed by consumers to be added in monthly electricity bill of the consumer with his consent
- EMI for all such consumers will be paid by DISCOM to the Bank after collecting the same from the consumers in the monthly electricity bill
- As a pilot in the city of Vishakhapatnam 600 consumers have registered, 250 have approved the loan and 200 system of 1 kW have been installed

- With the assurance of the DISCOM, it is easy for the bank to sanction the loan as bank is sure of getting the loan amount back through the DISCOM.
- For the DISCOM, it is beneficial because this target group gets the electricity at the subsidized rates.
- For the consumers, the saving in the electricity bill will be paid as EMI to the bank through the DISCOM, without the need of them to go to the bank

III. Innovative Group Net Metering and Virtual Net Metering by BSES Rajdhani Delhi

There is a possibility that an individual has more than one electricity connections at two different buildings in same area or different area. One such building may be his residence and the other one his shop or office. It is also possible that at one location due less shade free rooftop area or due to Distributing Transfer Capacity, it is not feasible to install Rooftop Solar whereas at the other place one has ample rooftop are for the installation of Rooftop Solar. In such situation, one can install Rooftop Solar at one place and enjoy the benefit of the solar power generation in the other place in the same DISCOM area. This concept is group Net Metering. Similar is the concept of Virtual Net metering in which more than one consumers have share in the Rooftop Solar plant at one location and the power generated and injected in the grid through that plant is adjusted in the bills of more than one consumers as per their share in the Rooftop solar plant. Features of Group Net Metering and Virtual Net Metering by BSES Rajdhani Delhi are as under:

- **Group Net Metering** is applicable for all consumers
- “Group Net Metering” means an arrangement whereby surplus energy generated/injected from a Renewable Energy System is exported to the grid through Net Meter and the exported energy is adjusted in more than one electricity service connection(s) of the same consumer located within the same distribution licensee’s area of supply
- Exported Energy generated is adjusted in more than one service connection of the same consumer within same DISCOM service area
- **Virtual Net Metering** is Applicable for residential consumers, Group housing societies, offices of Government /Local Authorities and Renewable Energy Generators registered under Mukhya Mantri Kisaan Aay Badhotari Yojna.
- “Virtual Net Metering” means an arrangement whereby entire energy generated/injected from a Renewable Energy System is exported to the grid from renewable energy meter/ gross meter and the energy exported is adjusted in more than one electricity service connection(s) of participating consumers located within the same distribution licensee’s area of supply;
- Entire energy generated is exported to the grid from RE Meter/Gross Meter and the Energy exported is adjusted in more than one electricity service connection(s) of participating consumers located within the same DISCOM area in the same proportionate as the consumers have share in the installed Renewable Energy System

IV. Innovative Rent a Roof Model of KSEB

Residential consumers generally avoid capital investment in the Rooftop solar due to fear of return from the investment, its maintenance and time period required for return of the capital investment. Kerala State Electricity Board after demand aggregation and survey of the consumers have come out with Rent the Roof Model as per following details:

- Kerala State Electricity Board (KSEB) will hire the roof of the owner of the building
- KSEB will install the RTS through RESCO Developer and entire energy generated will be exported to the Grid

- KSEB may also install the RTS in EPC mode and itself become the RESCO developer
- Rooftop owner will get 10-50% credit of the solar electricity generated
- 10% Credit in case of without subsidy
- 25% to 50% credit with subsidy and 12% to 25% share of consumer
- Consumers to get 25 years O&M guarantee
- KSEB will get benefit of cheaper distributed power and also benefit of RE in RPO Compliance