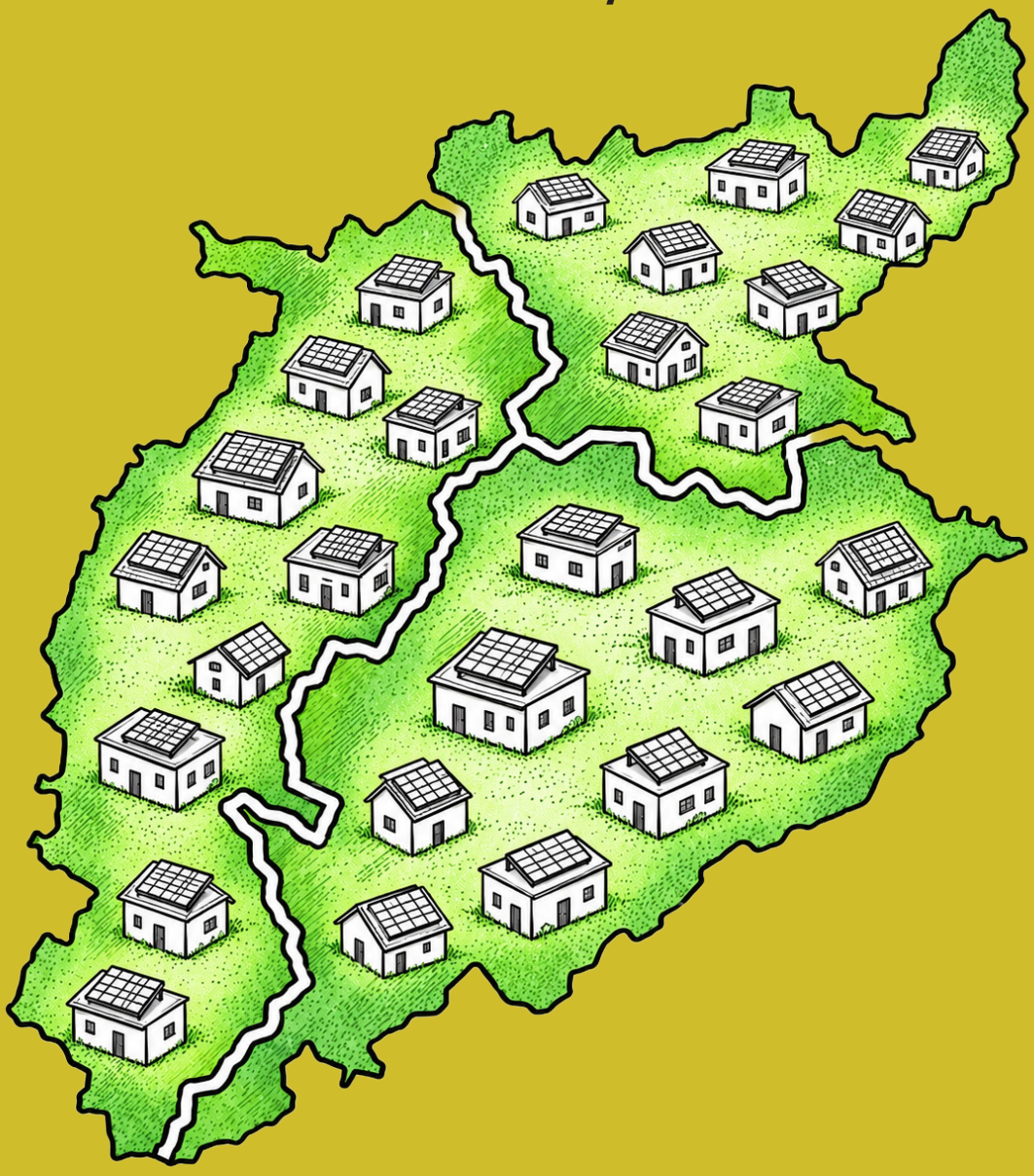
PROMISES, PROCESSES AND PROGRESS

Lessons from Rooftop Solar Deployment in Odisha, Jharkhand and Chhattisgarh under PM Surya Ghar



PROMISES, PROCESSES AND PROGRESS

Lessons from Rooftop Solar Deployment in Odisha, Jharkhand and Chhattisgarh under PM Surya Ghar

Authors: Dimitri Barury and Binit Das

Editor: Archana Shankar

Cover and design: Ajit Bajaj

Infographics: Vineet Tripathi

Photographs: Dimitri Barury

Layout: Kirpal Singh

Production: Rakesh Shrivastava and Gundhar Das



The Centre for Science and Environment is grateful to Bread for the World (BfW) for their support.



© 2026 Centre for Science and Environment

Material from this publication can be used, but with acknowledgement.
Maps used in this document are not to scale.

All photographs were taken by by Dimitri Barury during the CSE field survey.

Citation: Dimitri Barury and Binit Das 2026, *Promises, Processes and Progress: Lessons from Rooftop Solar Deployment in Odisha, Jharkhand and Chhattisgarh under PM Surya Ghar,* Centre for Science and Environment, New Delhi

Published by
Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phone: 91-11-40616000
Fax: 91-11-29955879
E-mail: cse@cseindia.org
Website: www.cseindia.org

CONTENTS

1. Introduction P7

1.1 The scheme at scale **P8**

1.2 Historical bottlenecks in rooftop solar adoption **P10**

1.3 An uneven map **P13**

1.4 Why these three states **P15**

1.5 Research questions and approach **P16**

1.6 Policy frameworks at a glance: Jharkhand, Odisha and Chhattisgarh **P17**

2. Odisha—The dynamics of rapid RTS deployment P21

2.1 OREDA: The policy anchor **P22**

2.2 The DISCOM **P23**

2.3 The vendor ecosystem: What active oversight produces **P26**

2.4 Banking perspectives on RTS adoption **P28**

2.5 Demand-side realities: The prosumer experience **P30**

Case study: Malaya Ranjan Pal, Cuttack **P32**

Quantifying the consumer experience **P33**

Case study: Dr Debabrata Pattnaik, Sambalpur **P35**

3. Jharkhand—High fiscal incentives amidst operational stagnation P37

3.1 JREDA: The state nodal agency **P38**

3.2 The DISCOM **P39**

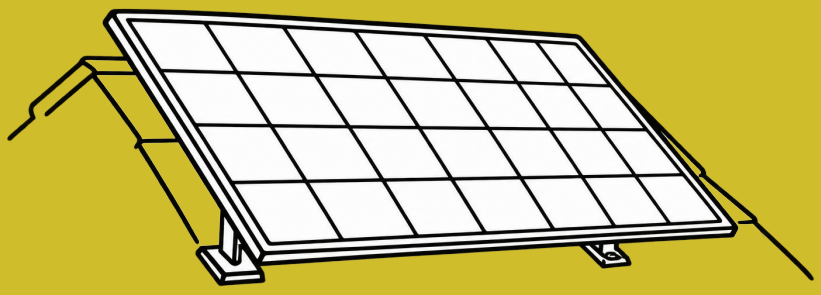
3.3 The bi-directional meter conversion **P40**

3.4 The vendor ecosystem **P42**
3.5 The banking channel **P44**
3.6 Consumer base **P46**
Case study: Deepak Devi, Bokaro—An early adopter **P47**
Quantifying the consumer experience **P49**

4. Chhattisgarh—Administrative leadership driving rooftop solar deployment P51
4.1 CREDA **P52**
4.2 CSPDCL: The distribution utility **P53**
Utility-Led Aggregation for PM Awas Yojana households **P56**
4.3 The vendor ecosysten **P57**
4.4 The banking channel **P59**
4.5 The consumer experience **P61**
Case study: Dr Shahid Ahmad Khan, Bilaspur **P61**
Quantifying the consumer experience **P63**

5. Conclusions and recommendations P65
5.1 Key findings from the assessment **P66**
5.2 Recommendations **P69**
5.4 Conclusion **P75**

References **P77**
Annexures **P80**



INTRODUCTION

India added a record 8.71 GW of rooftop solar capacity in FY 2025–26, with residential consumers accounting for 82 per cent of new installations in Q1 2026.

Rooftop solar adoption remains highly uneven across states. As of June 2026, Odisha commissioned 1.17 lakh systems under PM Surya Ghar, Chhattisgarh 71,219 and Jharkhand just 2,886, reflecting differences in consumer demand and implementation capacity.

Odisha's DISCOM-led facilitation, Chhattisgarh's administrative coordination and Jharkhand's need for stronger outreach demonstrate how institutional capacity, vendor engagement and streamlined processes influence rooftop solar deployment.

For much of the past decade, India's rooftop solar story was centred on Gujarat and Maharashtra. Surat became its defining example, with an established vendor network, informed consumers, and strong institutional support that enabled early adoption well before the launch of PM Surya Ghar: Muft Bijli Yojana. By April 2026, however, that centre of gravity had begun to shift. Lucknow overtook Surat to become the country's leading district under the scheme, surpassing 87,000 rooftop solar installations.[1] The shift reflects a broader trend. Uttar Pradesh has consistently ranked among the top states in monthly residential rooftop solar additions, and in June 2026 received the PM Surya Ghar Excellence Award from the Ministry of New and Renewable Energy for its implementation of the scheme. While Gujarat and Maharashtra continue to lead in cumulative installations, recent growth has expanded beyond the traditional rooftop solar markets.

The same trend also highlights a contrasting reality. As of 31 March 2026, India's cumulative rooftop solar capacity stood at 25.73 GW, with the majority concentrated in a handful of western and southern states.[2] Bihar had 218 MW of installed rooftop solar capacity, Odisha 317 MW, Jharkhand 95 MW and West Bengal 67 MW. Together, these four states account for nearly one-fourth of India's population but only around 2 per cent of the country's rooftop solar capacity. The gap points not to a lack of resource potential, but to differences in how effectively the scheme is being implemented on the ground.

Two years after the launch of PM Surya Ghar, residential rooftop solar has gained significant momentum in states such as Gujarat, Maharashtra, Uttar Pradesh and Kerala. The next phase of the programme will depend on whether similar progress can be achieved in states where implementation systems are still evolving. Understanding the factors that enable or constrain deployment in these regions is therefore critical to achieving the scheme's national targets.

This report examines rooftop solar deployment in Odisha, Jharkhand and Chhattisgarh. These states were selected for their combination of significant solar potential and relatively modest rooftop solar adoption, despite supportive policy frameworks. Drawing on field research and stakeholder consultations, the report examines how state institutions, distribution utilities, vendors, financial institutions and consumers influence implementation outcomes, and identifies operational measures that can accelerate rooftop solar adoption.

1.1 The scheme at scale

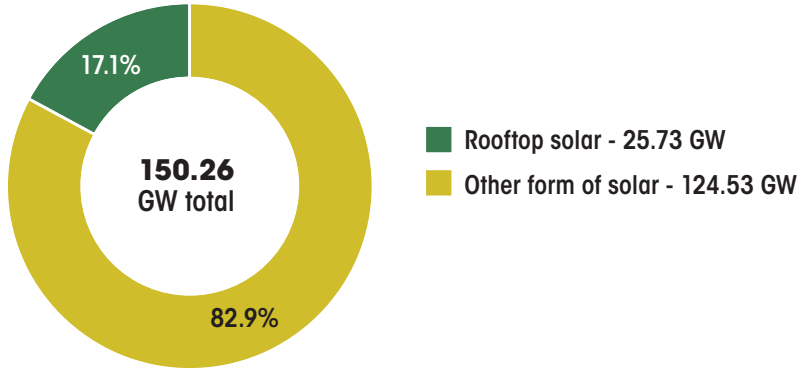
PM Surya Ghar: Muft Bijli Yojana, launched on 13 February 2024, aims to install rooftop solar systems on one crore households by 31 March 2027.[3] It is the world's

largest residential rooftop solar programme and has fundamentally altered the trajectory of India's rooftop solar market. Before its launch, India had built nearly 11 GW of cumulative rooftop solar capacity over fifteen years under the Jawaharlal Nehru National Solar Mission (JNNSM) and successive phases of the MNRE Rooftop Solar Programme.[4]

As of 31 March 2026, India's cumulative grid-connected rooftop solar capacity stood at 25.73 GW, accounting for 17.1 per cent of the country's total installed solar capacity of 150.26 GW.[5] During FY 2025–26 alone, rooftop solar additions reached a record 8.71 GW. The residential segment accounted for 82 per cent of new rooftop installations in the first quarter of 2026, reflecting a decisive shift in market composition under PM Surya Ghar.[6] By March 2026, more than 34 lakh households had installed rooftop solar systems under the scheme, of which 22.7 lakh installations were completed during FY 2025–26 (see *Figure 1: Share of total installed solar capacity* and *Figure 2: Annual rooftop solar capacity added*).[7]

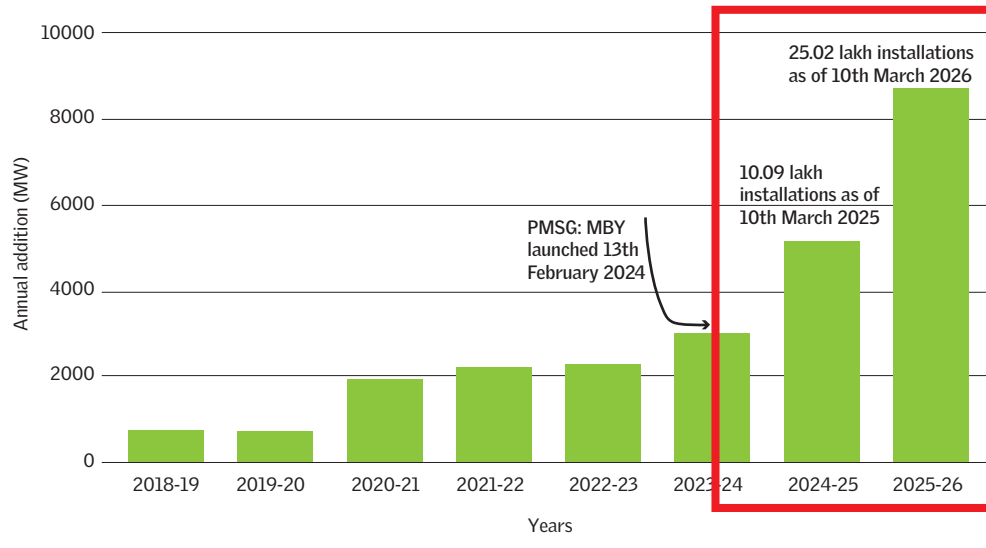
These figures illustrate the progress achieved in the scheme's first two years. Reaching the target of one crore installations by March 2027 will require installing around 5.5 lakh systems every month. The pace of deployment has risen through 2026: weekly installations stood at around 50,000 in the second week of June, translating to a monthly rate of roughly 2–2.5 lakh, and had crossed 90,000 a week by July,[8] taking the monthly rate closer to 4 lakh. Sustaining and further building on this trajectory will depend less on the scheme's design than on the capacity of state-level implementation systems. The depth of the vendor network, DISCOM preparedness, access to affordable finance and consumer awareness continue to vary significantly across states. Identifying where these conditions need strengthening, and how they influence rooftop solar adoption, is the central focus of this report.

Figure 1: Share of total installed solar capacity (as on 31 March 2026)



Source: MNRE—Year-wise achievements, https://mnre.gov.in/en/year-wise-achievement/

Figure 2: Annual rooftop solar capacity added (MW)



Source: Compiled by the authors based on Ministry of New and Renewable Energy (2019, 2024, 2026), Press Information Bureau (2024)

PM Surya Ghar has also reshaped India's rooftop solar market by shifting new installations decisively towards the residential segment. Before the scheme, commercial and industrial (C&I) consumers accounted for an estimated 70–80 per cent of the country's cumulative rooftop solar capacity, driven by favourable project economics and relatively fewer procedural barriers. While C&I consumers still account for the largest share of the installed base, their contribution to new installations fell to around 18 per cent in the first quarter of 2026, with residential consumers accounting for the remaining 82 per cent.[9]

Commercial and industrial rooftop solar continues to expand in absolute terms because high retail electricity tariffs, favourable project economics and established financing mechanisms make investments commercially attractive. However, the government and institutional segment remains a small contributor, accounting for less than one per cent of new rooftop solar additions in the first quarter of 2026.[10] Unlike residential systems under PM Surya Ghar, these projects are largely implemented through dedicated government programmes such as CPSU Phase II and state-specific tenders. Procurement cycles, budget approvals, and multiple administrative clearances slow their deployment.

1.2 Historical bottlenecks in rooftop solar adoption

Before the launch of PM Surya Ghar, India's rooftop solar sector evolved under the Jawaharlal Nehru National Solar Mission (JNNSM) and successive phases of the

MNRE Rooftop Solar Programme. While these initiatives successfully expanded utility-scale solar through competitive bidding, they were less effective in driving rooftop solar adoption. Understanding these structural constraints is essential to assessing what PM Surya Ghar has changed.

Residential rooftop solar operated under a fragmented system of subsidies and net metering administered by state nodal agencies and DISCOMs. Subsidies covered only a small share of installation costs and were often disbursed six to twelve months after commissioning.[11] Households had to bear the full upfront investment, typically between Rs 60,000 and Rs 1 lakh for a 2–3 kW system, with limited access to dedicated financing. At the same time, DISCOMs had little commercial incentive to promote rooftop solar, as it reduced consumption among high-paying residential and commercial consumers that cross-subsidised other consumer categories.

The implementation process itself presented additional barriers. Technical feasibility approvals and net metering procedures were often lengthy and varied by state. Consumers had to navigate multiple agencies, varied documentation requirements, and complex application procedures with limited institutional support. In Tier-2 and Tier-3 cities, as well as rural areas, awareness of rooftop solar remained low, while the vendor ecosystem was still developing. These constraints reinforced one another, slowing market growth despite improving technology costs.

Access to finance remained another critical bottleneck. Rooftop solar loans were not covered under priority sector lending, and few banks offered standardized loan products for residential consumers. Borrowers were typically assessed under conventional consumer lending norms, requiring collateral, credit history and extensive documentation, making rooftop solar unaffordable for many households. Vendors, particularly in states with slower approval processes, also faced prolonged payment cycles and uneven market conditions, limiting competition and affecting installation quality. As a result, market development remained concentrated in a few states with stronger institutional capacity and more mature ecosystems.

PM Surya Ghar addressed several of these constraints simultaneously. The scheme provides Central Financial Assistance (CFA) of up to Rs 78,000 for residential systems up to 3 kW, structured as Rs 30,000 per kW for the first 2 kW and Rs 18,000 per kW for the third.[12] For a typical 2-kW system, the subsidy covers nearly 60 per cent of the installation cost, substantially reducing the upfront investment required from households.

The scheme also simplified implementation. A single National Portal now integrates application submission, vendor selection, subsidy processing and commissioning, replacing the fragmented processes that previously varied across states.[13] Residential consumers can also access collateral-free loans through participating public sector banks at an interest rate of 5.75 per cent. In addition, DISCOMs are recognized as the primary implementation agencies and receive performance-linked incentives based on the number of systems commissioned within their service areas. While these incentives strengthen utility participation, other key stakeholders-including state nodal agencies, vendors and banks, continue to operate outside a comparable performance framework, relying primarily on their institutional mandates (see *Table 1: PM Surya Ghar: Muft Bijli Yojana*).

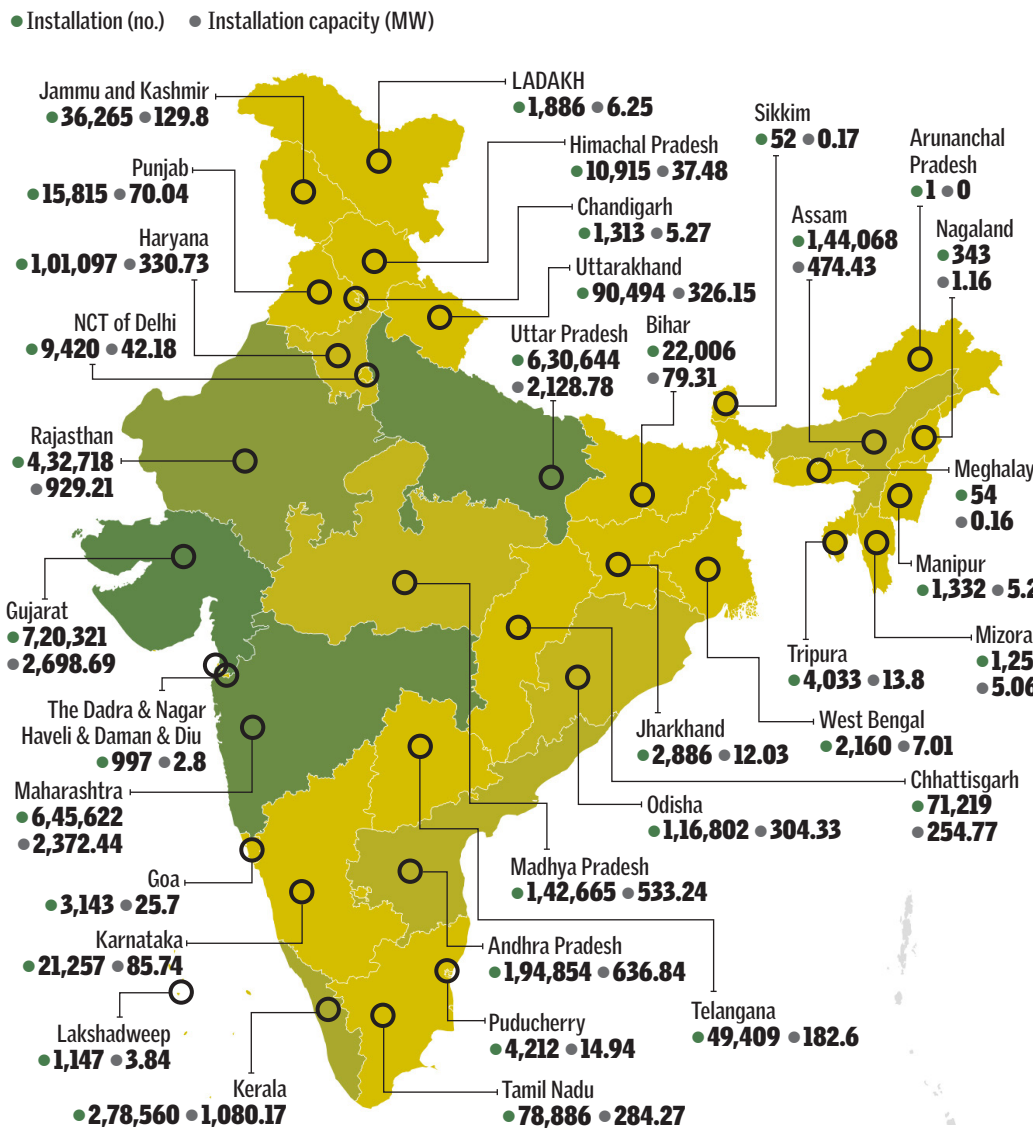
Table 1: PM Surya Ghar: Muft Bijli Yojana

Parameter	Detail
Scheme	Pradhan Mantri Surya Ghar: Muft Bijli Yojana
Launch date	13 February 2024
Implementing ministry	Ministry of New and Renewable Energy
National Programme Implementation Agency	REC Limited
Financial outlay	Rs 75,021 crore (US $8.53 billion)
Target installation	1 crore households
Target additional capacity	30 GW
Target date	31 March 2027
Cumulative installed capacity (31 March 2026)	9.57 GW
Households solarized (30 May 2026)	~40 lakh
Central Financial Assistance disbursed (30 May 2026)	Rs 17,968 crore

Source: MNRE; Lok Sabha statement of Minister of State for New and Renewable Energy, 20 March 2026

As of March 2026, the National Portal had recorded more than 70 lakh registrations.[14] Yet registrations alone do not indicate successful implementation. The share of applications that progress to commissioned rooftop solar systems varies significantly across states. Understanding these differences in conversion rates, and the institutional factors driving them, forms the starting point of this assessment (see *Map 1: State-wise rooftop solar achievement in India*).

Map 1: State-wise rooftop solar achievement in India



Source: Compiled from PM Surya Ghar: Muft Bijli Yojna National Portal, achievement dashboard, as on 30 June 2026.

1.3 An uneven map

As per CSE's analysis of application and installation data as of 30 June 2026, the number of rooftop solar systems installed under PM Surya Ghar varies sharply across states, offering the clearest picture of where the scheme has taken root and where it has not. Five states account for a large share of national installations. Gujarat leads with 7.20 lakh systems commissioned, followed by Maharashtra (6.46 lakh), Uttar Pradesh (6.31 lakh), Kerala (2.79 lakh) and Rajasthan (2.45 lakh). These states combine large populations, established solar markets, and

years of prior rooftop solar activity that PM Surya Ghar has built upon rather than created.

At the other end, several states have installed only a few thousand systems despite having functioning DISCOMs and reasonable population bases. West Bengal has commissioned just 2,160 systems, Jharkhand 2,886, and the National Capital Territory of Delhi 9,420. Several north-eastern states report installation numbers in the low hundreds or fewer.

Odisha, Jharkhand and Chhattisgarh, the three states this report examines, rank differently on this scale. Odisha has commissioned 1.17 lakh systems, a number that places it ahead of higher-profile states such as Uttarakhand and Tamil Nadu in absolute terms. Chhattisgarh, with 71,219 installations, sits lower. Jharkhand, at 2,886 installations, is among the lowest in the country, comparable to West Bengal despite Jharkhand having a much smaller application base to begin with.

A high number of installations does not by itself indicate that a state's implementation system is working well, and a low number does not always mean the opposite. Tamil Nadu converts 80.3 per cent of its applications into installations, the highest rate in the country, but it received only 98,193 applications in total, producing 78,886 installations. Andhra Pradesh converts only 18.6 per cent of its applications, yet because it received over 10.49 lakh applications, its installation count reaches 1.95 lakh, nearly two and a half times Tamil Nadu's figure. A state can therefore post a large installation number while its underlying system converts only a small fraction of consumer interest, or post a modest installation number while converting almost everything it receives. These are two different achievements, and conflating them obscures rather than clarifies how a state's scheme is actually performing.

The same distinction separates Odisha, Chhattisgarh and Jharkhand from one another. Odisha and Chhattisgarh have generated substantial consumer interest, with 2.72 lakh and 2.13 lakh applications, respectively, but convert less than half into installations (43.0 per cent and 33.5 per cent). Jharkhand's problem is different. Its application base of 11,584 is a fraction of the other two states', so its low installation count of 2,886 reflects weak demand generation as much as its middling 24.9 per cent conversion rate. Odisha and Chhattisgarh are struggling primarily to execute on interest they have already generated; Jharkhand has not yet generated that interest at scale.

1.4 Why these three states

This report focuses on Odisha, Jharkhand, and Chhattisgarh because each represents a distinct stage in implementing residential rooftop solar under PM Surya Ghar. Together, they show how differences in policy design, institutional capacity, and on-ground execution shape deployment outcomes.

Odisha has installed 317.60 MW of rooftop solar capacity under PM Surya Ghar and preceding schemes, out of the state's total solar power capacity of 1,120.97 MW, as per MNRE data as of 30 June 2026. The state has introduced several enabling policy measures, including a 30-day Direct Benefit Transfer (DBT) guarantee for subsidy disbursement, virtual net metering, and a Utility-Led Aggregation (ULA) model that reduces households' upfront costs by aggregating installations through the DISCOM. Odisha also permits the highest net metering capacity among the three states. While the policy framework is well established, the next challenge is strengthening implementation by expanding vendor capacity, improving coordination with financial institutions, and accelerating DISCOM-led execution.

Jharkhand presents a different picture. Previous state policy, including the Jharkhand Solar Policy 2022, has offered relatively generous subsidies for eligible households, layered on top of central financial assistance. However, installed rooftop solar capacity in the state stands at only 95.80 MW as per MNRE data as on 30 June 2026, against a stated target of 250 MW by 2027.[15] The gap suggests that financial incentives alone have not been sufficient to drive uptake. Translating policy into deployment will require stronger institutional coordination, greater consumer outreach and more efficient implementation systems.

Chhattisgarh demonstrates how administrative focus can influence programme performance. As of 30 June 2026, the state has installed 240.90 MW of rooftop solar capacity under PM Surya Ghar and preceding schemes, out of a total solar power capacity of 2,026.67 MW, as per MNRE data. CREDA brings extensive experience in decentralized solar through programmes such as the Saur Sujala Yojana, which established a three-tier maintenance system for more than 1.5 lakh solar pumps. More recently, district collectors have assumed an active role in driving PM Surya Ghar implementation, CSPDCL has streamlined commissioning processes, and the Utility-Led Aggregation model is being expanded across all 33 districts. The case of Chhattisgarh highlights how dedicated governance and follow-through can enhance implementation, even in the absence of major policy reforms.

These three states are not intended to be compared against one another. Rather, they represent different pathways through which rooftop solar deployment can either accelerate or stall. Examining their experience provides a better understanding of the institutional, operational and market conditions that influence implementation under a common national framework.

1.5 Research questions and approach

This rapid assessment draws on four complementary sources of evidence.

First, the team conducted field research between May and June 2026 across the three focus states. In Odisha, field visits covered Bhubaneswar, Cuttack, Sambalpur and Jharsuguda. In Jharkhand, the study covered Ranchi, Bokaro and Khunti. In Chhattisgarh, fieldwork covered Raipur, Durg, Bilaspur, and Balod. The study conducted semi-structured interviews and focus group discussions with officials from state nodal agencies and DISCOMs, empanelled vendors, public sector banks, and residential consumers, including rooftop solar adopters and households registered under PM Surya Ghar.

Second, the study reviewed state policies, net metering regulations, subsidy frameworks and implementation guidelines, along with available DISCOM data on application processing, commissioning timelines and subsidy disbursement.

Third, the study analysed PM Surya Ghar National Portal data to assess registrations, applications, installations, and application-to-installation conversion rates across the three states.

Finally, the assessment draws on secondary literature, including MNRE programme documents, state policy notifications, previous CSE publications on decentralized renewable energy, and reports from the energy and policy sector.

This rapid assessment was conducted over a two-month period. The consumer interviews provide qualitative insights into household experiences but are not intended to represent a statistically representative sample. The availability of DISCOM data, particularly district-level information on subsidy disbursement and processing timelines, varied across the three states. Where data was available, it has been incorporated into the analysis; where it was not, the limitation has been noted. The assessment focuses primarily on residential rooftop solar under PM Surya Ghar. Commercial and industrial rooftop solar, as well as off-grid applications, are discussed only where they have a direct bearing on residential deployment.

1.6 Policy frameworks at a glance: Jharkhand, Odisha and Chhattisgarh

All three states implement residential rooftop solar under the common framework of PM Surya Ghar: Muft Bijli Yojana. The central scheme provides financial assistance, standardized technical specifications, empanelled vendors, net metering provisions and a common application platform through the National Portal. Beyond this common framework, states have adopted different policy and implementation approaches to accelerate rooftop solar deployment.

These variations include differences in state subsidies, net metering provisions, regulatory processes, implementation responsibilities and consumer facilitation mechanisms. Together, they shape how effectively the scheme is implemented and help explain the differences in rooftop solar deployment across states.

Table 2 compares the policy and regulatory frameworks of Jharkhand, Odisha and Chhattisgarh, highlighting the key provisions that distinguish each state's approach to residential rooftop solar (see *Table 2: Comparison of rooftop policies of Jharkhand, Odisha and Chhattisgarh*).

Table 2: Comparison of rooftop policies of Jharkhand, Odisha and Chhattisgarh

Parameter	Jharkhand	Odisha	Chhattisgarh
State nodal agency	JREDA	OREDA	CREDA
Implementing utility (DISCOM)	JBVNL	TPCODL, TPWODL, TPNODL and TPSODL	CSPDCL
Pre-existing state policy or scheme	Jharkhand Solar Policy 2022	Odisha Renewable Energy Policy 2022; no distinct rooftop-specific programme predates PM Surya Ghar at state level	CREDA Solar Policy 2017–30; Saur Sujala Yojana, which built a three-tier maintenance system for more than 1.5 lakh solar pumps and established procurement, quality assurance and after-sales systems CREDA now draws on for rooftop solar
State subsidy over PM Surya Ghar CFA	No add-on state subsidy for PM Surya Ghar	Additional state subsidy scaled by capacity: Rs 25,000 for 1 kW (total Rs 55,000 with central CFA), Rs 50,000 for 2 kW (total Rs 1,10,000), and Rs 60,000 for 3 kW and above (total Rs 1,38,000)	Additional state subsidy scaled by capacity: Rs 15,000 for 1 kW (total Rs 45,000 with central CFA), Rs 30,000 for 2 kW (total Rs 90,000), and up to Rs 30,000 for 3 kW and above (total Rs 1,08,000)
Utility-Led Aggregation (ULA)	Not applied	Active. DISCOM-led aggregation reduces upfront cost for low-income households whose consumption is up to 1kW	Active and expanding across all 33 districts for general residential consumers. A separate, larger ULA initiative targeting nearly one lakh PM Awas Yojana households is proposed and awaiting approval[16]

Parameter	Jharkhand	Odisha	Chhattisgarh
Virtual Net Metering (VNM)/ Group Net Metering (GNM) under PM Surya Ghar	Available in principle to PM Surya Ghar consumers under state policy, but fieldwork found no evidence of either mechanism being used in practice under the scheme so far	Applied within PM Surya Ghar implementation. No projects implemented.	Has both Group Net Metering (GNM) and Virtual Net Metering (VNM). The framework was introduced through the CSERC (Group Net Metering and Virtual Net Metering for Renewable Energy) Guidelines, 2022. One VNM project has been operational since Sept. 2025
Sanctioned load/ system capacity rules	Net metering eligible up to 1 kW to 1 MW, subject to sanctioned load and JSERC regulations. No specific percentage cap identified in fieldwork	Rooftop capacity capped at 90 per cent of sanctioned load rather than actual consumption, with automatic contract demand adjustment when installed capacity exceeds sanctioned load	No specific sanctioned-load percentage rule identified in fieldwork; system sizing operates under CSERC regulations
Consumer facilitation	Limited. JREDA's role is facilitative rather than operational; no structured grievance redress mechanism; consumers and vendors rely on informal channels including WhatsApp groups and personal contacts with officials	Strong DISCOM-led facilitation. TPWODL holds regular vendor review meetings; other DISCOMs are adopting similar practices	District collectors play an active facilitation role alongside CSPDCL and CREDA, including monthly coordination meetings in some districts
Institutional and consumer awareness	Low. Outreach depends largely on individual vendor initiative and word of mouth, with no dedicated state-level awareness push for PM Surya Ghar; consumer misinformation about smart meters is common	Comparatively strong, reinforced by word-of-mouth and demonstration effects among neighbours, though awareness of specific administrative steps such as subsidy redemption remains uneven	Improving but uneven across districts; continued outreach identified as a need

Source: Jharkhand State Solar Policy (2022); JSERC rooftop solar and group/virtual net-metering regulations (2015–2024); JBVNL net-metering instructions; Odisha Renewable Energy Policy (2022); OERC net-metering amendment (2022); CREDA and CSERC policies, guidelines and orders (2022–2026); CSE field interviews in Jharkhand, Odisha and Chhattisgarh (2026).

Jharkhand offers the strongest financial support among the three states, making rooftop solar highly attractive for consumer affordability. The state provides substantial income-linked capital subsidies in addition to the central financial assistance under PM Surya Ghar, along with complementary incentives such as SGST reimbursement, electricity duty exemptions, and provisions for innovative mechanisms like virtual net metering and community solar. However, despite this

favourable policy environment, rooftop solar deployment has remained relatively modest. This suggests that financial incentives alone cannot drive large-scale adoption without corresponding improvements in consumer awareness, vendor capacity, institutional coordination, and implementation efficiency.

Odisha stands out for its well-rounded policy structure, seamlessly pairing reasonable financial incentives with robust regulation and effective execution. The state has introduced consumer-centric measures such as a 30-day Direct Benefit Transfer (DBT) commitment for subsidy disbursement, higher net metering capacity limits, virtual net metering provisions, and utility-led aggregation models that reduce upfront costs for consumers. Equally important, Odisha's DISCOMs have actively supported programme implementation by streamlining approvals, vendor management, and consumer facilitation. This integrated approach highlights that strong institutional capacity and proactive utility participation can have a greater impact on rooftop solar deployment than financial incentives alone.

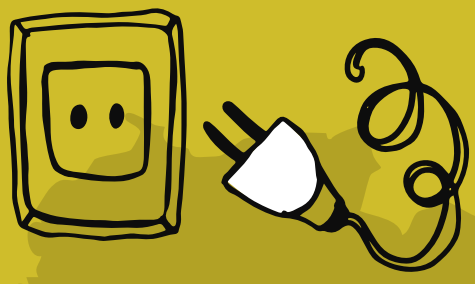
Chhattisgarh illustrates how administrative leadership can significantly improve programme performance even without offering the most generous policy incentives. Rather than relying primarily on additional subsidies, the state has focused on strengthening institutional coordination between CREDA, CSPDCL, and district administrations, simplifying approval processes, and expanding utility-led aggregation models, particularly for lower-income households under PM Awas Yojana. These measures have improved application processing and commissioning timelines and strengthened on-ground implementation. Chhattisgarh's experience demonstrates that effective governance, coordinated institutional support, and administrative intervention can accelerate rooftop solar adoption even in states where consumer economics are comparatively less favourable.

Table 3 compares the three focus states with Gujarat, Maharashtra and Rajasthan, which currently lead India in rooftop solar deployment. The comparison highlights the additional policy, institutional and implementation measures that have supported their progress and provides a useful benchmark for assessing opportunities in the three focus states (see *Table 3: A comparison with the states leading in rooftop solar in India*).

Table 3: A comparison with the states leading in rooftop solar in India

Parameter	Gujarat	Maharashtra	Rajasthan
Implementation body	GEDA as nodal agency with GUVNL and its four DISCOMS (UGVCL, DGVCL, PGVCL, MGVCL)	MEDA/MAHAURJA with MSEDCL, alongside five other DISCOMS including Adani Electricity, Tata Power, Torrent Power and BEST	RRECL with the Jaipur, Jodhpur and Ajmer DISCOMs
Cumulative rooftop capacity (30 June 2026)	7435.20 MW	5973.60 MW	2315.60 MW
Pre-PM Surya Ghar policy history	SURYA Gujarat (Surya Urja Rooftop Yojana) launched August 2019, offering a state subsidy of 40 per cent on systems up to 3 kW and 20 per cent on capacity to 10 kW. That structure made Gujarat the rooftop leader before any national scheme existed. Also ran MNRE Phase II from 2019	MERC notified net-metering regulations in September 2015, amended 2017, replaced by the Grid Interactive Rooftop RE Regulations in December 2019. Regulatory architecture arrived early; subsidy support came mainly through central Phase II	Net metering notified through RERC in the mid-2010s, with state effort concentrated on solar parks and utility-scale development rather than a dedicated residential rooftop subsidy
Demand drivers	High residential consumption, dense owner-occupied housing, and consumer familiarity built up over five years of a visible state scheme	The largest application pipeline in the country, high urban tariffs, and energy-intensive cities including Mumbai, Pune, Nagpur and Nashik	Strong irradiation and payback economics, with residential uptake still trailing the state's overall solar profile
Institutional drivers	State subsidy stacked on central CFA, net metering offered by all four DISCOMs and coordinated centrally through GEDA and the SURYA portal, with GERC as escalation authority	Chief-minister-level political ownership, dedicated delivery companies, and parallel programmes such as feeder solarization and Magel Tyala Saur Pump	Institutional capacity built around park development and large-project delivery

Source: MNRE, PM Surya Ghar state-wise installation data (20 July 2026); and Renewable Energy Policy (2023); Maharashtra Renewable Energy and Energy Storage Policy (2025–26 to 2035–36); Rajasthan Integrated Clean Energy Policy (2024) and Renewable Energy Policy (2023).



ODISHA—THE DYNAMICS OF RAPID RTS DEPLOYMENT

Odisha's DISCOMs increasingly treat PM Surya Ghar as core work, led by TPWODL's dedicated teams.

State policy promises subsidy within 30 days, but disbursement often runs late and the sanctioned-load cap limits system size.

Monthly vendor meetings at TPWODL, now spreading to other DISCOMs, have made installation more predictable.

App-based monitoring helps households shift loads to daytime, and satisfied users draw neighbours into the scheme.

Collateral-free loans are broadly accessible, but subsidy adjustment and documentation requirements still vary across bank branches.

Odisha has emerged as one of the fastest-growing rooftop solar markets under PM Surya Ghar: Muft Bijli Yojana. In early 2026, the state rose from 13th to ninth in the national rankings, with daily installations exceeding 100 in some distribution areas. This progress reflects more than favourable policy. It stems from Odisha's distribution companies' decision to take direct ownership of programme implementation, rather than treating PM Surya Ghar as a routine administrative scheme. That shift is most visible in how vendors operate and how quickly applications move from submission to commissioning, and it has changed the overall consumer experience of the programme. As of 15 June 2026, Odisha had recorded nearly 2.5 lakh applications on the national portal and around 1 lakh commissioned systems, an application-to-installation conversion rate of about 40 per cent, among the highest in eastern India. The state still has considerable room to expand rooftop solar adoption. Understanding this progress requires understanding the institutions involved, starting with the agency that laid the policy foundation on which DISCOM-led implementation now rests.

2.1 OREDA: The policy anchor

The Odisha Renewable Energy Development Agency (OREDA), the state's nodal agency for renewable energy, provides the policy and regulatory foundation for rooftop solar deployment. Through the Odisha Renewable Energy Policy 2022 and related regulations, the agency has introduced several measures that reduce barriers for residential consumers and create a more enabling environment for PM Surya Ghar implementation.

The policy framework includes a 30-day Direct Benefit Transfer (DBT) guarantee for subsidy disbursement after commissioning, a net metering limit of up to 500 kW, the highest among the three focus states, and provisions for Virtual Net Metering, allowing surplus electricity to be adjusted across multiple connections within the same distribution area.[17] The policy also provides for automatic contract demand adjustment when installed rooftop solar capacity exceeds the sanctioned load. Together, these measures improve consumer confidence and strengthen the business case for rooftop solar for households, vendors and financial institutions alike.

OREDA's role in the day-to-day implementation of PM Surya Ghar, however, is relatively limited. As a residential, grid-connected programme, the scheme is implemented primarily through the state's four DISCOMs, which handle application processing, inspections, net metering, and commissioning. OREDA's contribution is therefore concentrated on policy formulation, regulatory coordination and overall programme support rather than operational execution.

Odisha's policy framework provides a strong foundation for rooftop solar deployment. The remaining challenge is ensuring that implementation systems operate with the same level of efficiency. As the following sections show, much of Odisha's recent progress has been driven by the DISCOMs' ability to translate this policy framework into timely on-the-ground execution.

2.2 The DISCOM

The four distribution companies operating in Odisha play a central role in implementing PM Surya Ghar. While all operate under the same policy framework and regulatory provisions, their approaches and operational capacities vary. TPCODL serves the central region, including Bhubaneswar and Cuttack; TPWODL covers the western region, including Sambalpur and Sundargarh; TPNODL serves northern Odisha; and TPSODL covers the southern districts. Together, they handle application processing, technical inspections, net metering, commissioning, and consumer support.

Despite differences in geography and consumer base, all four DISCOMs face two common operational challenges.

The first is the regulatory cap that limits rooftop solar capacity to 90 per cent of the consumer's sanctioned load rather than actual electricity consumption. Both DISCOM officials and vendors identified this provision as a constraint, as it often prevents consumers from installing systems that match their energy requirements without offering a corresponding technical benefit at current levels of rooftop solar penetration.

The second relates to ownership of electricity connections. A significant number of residential connections in Odisha remain registered in the names of deceased family members. Because PM Surya Ghar applications must match the registered consumer details, many otherwise eligible households are unable to apply until ownership is formally transferred. The absence of a simplified transfer process has become an avoidable barrier to adoption. Consumer grievances filed with the DISCOMs have been an important channel through which these and other implementation gaps surface, and officials indicated that grievance data is periodically reviewed to identify recurring issues and inform corrective measures (see *Annexure 1*).

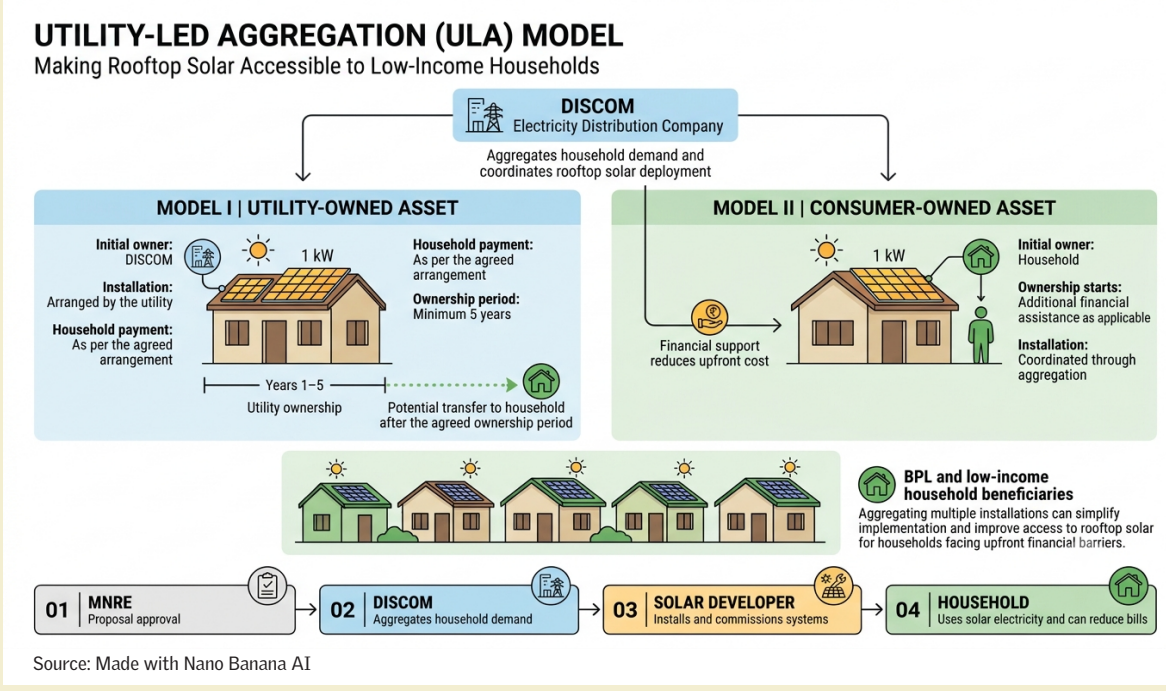
Within this common operating environment, Tata Power Central Odisha Distribution Limited (TPCODL) accounts for the largest share of applications and installations. Serving the urban centres of Bhubaneswar and Cuttack, it benefits from higher consumer awareness, greater population density and the state's most

THE UTILITY-LED AGGREGATION (ULA) MODEL

One of Odisha's most distinctive interventions under PM Surya Ghar is the Utility-Led Aggregation (ULA) model. Implemented across all four DISCOMs, the model addresses a key limitation of the conventional rooftop solar market by making the scheme more accessible to low-consumption and economically weaker households. Under the standard PM Surya Ghar process, consumers are responsible for selecting an empanelled vendor, comparing quotations, arranging finance and managing the installation. While this model works reasonably well for informed consumers, it can be challenging for households with limited financial resources or little familiarity with rooftop solar.

The ULA model shifts much of this responsibility to the DISCOM. Instead of individual consumers procuring systems, the utility aggregates demand, standardizes equipment specifications, and procures rooftop solar systems through a competitive process. Vendors are responsible only for installation and maintenance, while the DISCOM oversees procurement, quality assurance and implementation. This reduces both transaction costs and uncertainty for consumers. The model has also lowered the upfront financial burden. For a 1-kW rooftop solar system, the consumer contribution has been reduced to about Rs 1,875, compared to more than Rs 5,000 under the conventional route. Odisha has already installed more than 13,000 systems through the ULA model, making it one of the largest utility-led aggregation initiatives for residential rooftop solar in the country.

The primary beneficiaries are households with small electricity connections that the conventional vendor-led market often underserves. By standardizing prices and equipment, the model reduces mis-selling risk, improves quality assurance, and removes many of the information barriers first-time consumers face. Rather than replacing the existing market, the ULA model complements it by targeting a consumer segment that private vendors have found difficult to serve profitably. The model also illustrates a broader lesson from Odisha's experience. DISCOMs need not limit their



Source: Made with Nano Banana AI

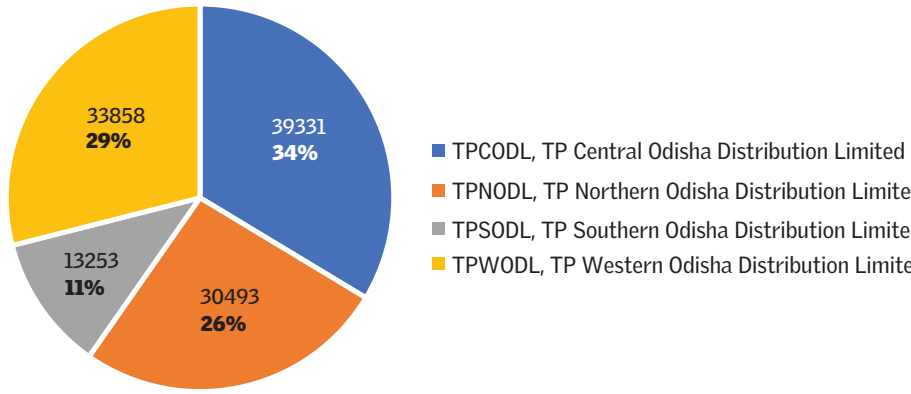
role to processing applications and issuing approvals. By taking responsibility for procurement, quality assurance and consumer facilitation, they can actively expand the rooftop solar market. Odisha's experience suggests that when utilities assume this broader implementation role, rooftop solar adoption can accelerate beyond what subsidy support alone can achieve.

established vendor network.[18] Field discussions with TPWODL also pointed to another factor that initially contributed to this concentration. Bhubaneswar was among the first areas where the state top-up subsidy was introduced, while consumers in the remaining DISCOM areas were brought under the programme later. As state-wide implementation expanded and vendor networks grew, this gap has gradually narrowed.

While TPCODL leads in absolute installation numbers, field evidence suggests that TPWODL has recorded the strongest operational improvement. Covering a geographically larger and more dispersed service area with a smaller urban consumer base, the utility has nevertheless achieved one of the fastest rates of installation growth in the state. DISCOM officials attributed this progress to regular engagement with vendors, dedicated teams responsible for PM Surya Ghar implementation, and closer monitoring of inspections and commissioning. This operational strength is also visible in supply reliability. Both TPNODL and TPWODL have seen a steady decline in outage frequency and duration over the past four years, a trend that has moved alongside their installation growth rather than against it.

A defining feature of Odisha's approach is that the DISCOMs have treated PM Surya Ghar as a core operational responsibility rather than an additional scheme layered onto existing work. TPWODL offers a clear example of what this ownership looks like in practice, and similar approaches are gradually being adopted across the state's other DISCOMs. This diffusion of practice, rather than any single policy change, is what distinguishes Odisha's recent progress and illustrates how utility-led execution can shape programme outcomes within a common national framework (see *Graph 1: DISCOM-wise distribution of rooftop solar installations in Odisha*).

Graph 1: DISCOM-wise distribution of rooftop solar installations in Odisha



Source: PM Surya Ghar: Muft Bijli Yojana National Portal; achievement dashboard, as on 30 June 2026.

2.3 The vendor ecosystem: What active oversight produces

Odisha has more than 700 empanelled vendors on the National Portal, suggesting a well-developed rooftop solar market. Field observations, however, indicate that the number of empanelled vendors does not necessarily reflect the market's quality or capacity. The effectiveness of the vendor ecosystem depends as much on oversight and coordination as on the number of registered installers.

A key challenge lies in the national empanelment process itself. Registration requires only a valid electrical contractor's licence, allowing firms with limited rooftop solar experience to enter the market. Field interactions revealed that some vendors outsource technical work, lack basic system design capabilities, or have limited understanding of installation standards. This has led to poor system sizing, inadequate earthing, substandard mounting structures, and weak after-sales service. Experienced vendors interviewed during the assessment noted that only a small proportion of empanelled vendors possess the technical expertise required to consistently deliver quality installations.

Installation quality is particularly important in Odisha, where many districts are vulnerable to cyclones and high winds. Field inspections found instances in which vendors had used hollow mild steel sections instead of the galvanized iron mounting structures recommended in the installation guidelines.[19] Such substitutions reduce the structural resilience of rooftop systems but are often difficult to detect during routine inspections, highlighting the need for stronger quality assurance throughout the installation process.

Commercial pressures further influence installation quality. Vendors reported that subsidy reimbursements often take two to three months, requiring them to commit substantial working capital while operating on margins of only 10–15 per cent. Larger firms can generally able to absorb these delays, whereas smaller vendors frequently struggle with cash flow. Some respond by reducing installation costs, while others gradually withdraw from the market, limiting consumer access in smaller towns and peri-urban areas.

One of Odisha's distinguishing features is the active engagement between DISCOMs and vendors. TPWODL conducts regular monthly meetings with empanelled vendors to review installation progress, discuss operational issues and clarify quality requirements. Vendors reported that this structured engagement has made the implementation process more predictable, reducing delays and improving on-the-ground coordination. The utility's recent growth in installations has coincided with this practice. TPCODL, TP Northern Odisha

Distribution Limited (TPNODL) and TP Southern Odisha Distribution Limited (TPSODL) have also begun organizing vendor meetings, though these remain less frequent and less structured than TPWODL's. Vendors operating across multiple DISCOM areas noted that this growing consistency in communication has made implementation more predictable, regardless of which utility they were working with.[20]

Odisha's experience suggests that active oversight can significantly strengthen vendor performance without changing the national empanelment framework. While eligibility criteria are determined centrally, DISCOMs can influence market quality through regular engagement, technical guidance and closer monitoring of installation practices. Introducing common quality benchmarks, periodic performance reviews and stronger emphasis on after-sales service would further improve the reliability of the vendor ecosystem and strengthen consumer confidence in the programme.



Team of SolarSack, a rooftop solar vendor based in Bhubaneswar



Vendor in Sambalpur, with rooftop panel on his roof



Solar meters installed in a residence in Sambalpur

2.4 Banking perspectives on RTS adoption

Access to affordable finance is a critical component of PM Surya Ghar, particularly for residential consumers who rely on loans to meet the upfront cost of installation. The scheme provides collateral-free loans of up to Rs 2 lakh at an interest rate of around 6 per cent for a tenure of up to ten years. Applications are processed through the National Portal, which is integrated with the Jan Samarth portal, allowing consumers to apply for both the subsidy and the loan through a common digital platform.

The financing process is designed to be straightforward. After registering on the National Portal and selecting an empanelled vendor, the consumer submits the required documents, including the vendor quotation, KYC details and application ID. Following credit appraisal, the bank sanctions the loan and disburses the amount to the vendor, typically in stages, with an advance released after sanction and the balance after commissioning. Once the DISCOM completes inspection and commissioning, the CFA is transferred to the consumer's loan account through the National Portal.

Field interactions suggest that the financing architecture functions reasonably well in principle but faces operational gaps during implementation. One recurring issue relates to consumer awareness of the subsidy redemption process. Although the National Portal generates an e-token that enables transfer of the subsidy to the loan account, many consumers reported being unaware of this step. Vendors also differed in the level of support they provided, resulting in confusion about whether the subsidy had been credited and how it affected the outstanding loan amount.

The handling of subsidy credits also varied across bank branches. In some cases, subsidy amounts were promptly adjusted against the loan principal and the EMI recalculated. In others, the subsidy remained in the account without corresponding changes to the repayment schedule, creating uncertainty for borrowers. Similar issues were observed during fieldwork in Jharkhand and Chhattisgarh, suggesting that this is a broader implementation issue rather than one specific to Odisha.

Field discussions also highlighted two recurring categories of consumer complaints. In the first, banks had disbursed loans to vendors, and interest had begun accruing, even though installation remained incomplete for several months. Consumers were servicing loans for systems that had not yet been commissioned, while vendors and banks lacked a clear mechanism for resolving delays. In the second, errors in consumer account details, particularly incorrect electricity connection numbers

entered during application, prevented commissioning because the National Portal and DISCOM records did not match. Correcting these errors often required cancellation of the existing application and submission of a fresh one, increasing delays for both consumers and vendors.

Interactions with public sector banks revealed considerable variation in branch-level preparedness. Larger national banks such as SBI and PNB were generally more familiar with the scheme and processed a higher volume of rooftop solar loans. In contrast, awareness among regional and rural banks remained limited. Some branch managers indicated that they had received very few applications and were still becoming familiar with the operational requirements of the scheme.

The documentation requested from consumers also varied across branches. Some sought additional income certificates, property documents or guarantors that were not required under the scheme guidelines. As a result, vendors frequently assumed the role of loan facilitators, helping consumers navigate procedures that were intended to be standardized. Greater uniformity in documentation requirements, together with branch-level orientation on loan processing and subsidy adjustment, would significantly improve the consumer experience and reduce unnecessary delays.

Financing has largely stopped being a barrier to residential rooftop solar adoption in Odisha. The loan products exist and are broadly accessible, but their reliability depends heavily on how consistently individual bank branches implement them. Standardizing subsidy adjustment procedures and documentation requirements across banks would close much of this gap.



SBI IRC branch in central-west Bhubaneswar, Odisha



PNB CRPF branch in a major residential area of Bhubaneswar



UCO Pulnakhara branch in peri-urban Khordha district, Odisha



IOB IRC branch in a major residential region of Bhubaneswar, Odisha



Odisha Grameen Bank, Pulnakhara branch, in rural Khordha district



SBI branch in Burla, Sambalpur, western Odisha

2.5 Demand-side realities: The prosumer experience

The rapid growth of rooftop solar in Odisha has also created a new category of electricity consumers. Households no longer buy electricity only from the grid. Many now generate, consume, and export electricity through their own rooftop solar systems. This shift from consumer to 'prosumer' is changing how households interact with the electricity network.



Consumers monitoring their rooftop solar performance through the official DISCOM app



Neighbourhood influence driving a local wave of new rooftop solar installations

Field interactions suggest that most consumers initially adopt rooftop solar to reduce electricity bills. Earlier, tracking consumption and generation required consumers to rely on manual meter readings or wait for monthly utility bills, making it difficult to monitor usage patterns in real time (see *Annexure 2*). Once systems are commissioned, many begin monitoring daily generation through mobile applications, and this shift has made the process considerably easier, allowing consumers to develop a clearer understanding of their household energy use. High-load activities such as pumping water and running washing machines are increasingly shifted to daytime hours to maximize self-consumption of solar generation.

Consumers generally expressed satisfaction with the technical performance of rooftop solar systems. The most common concerns related not to electricity generation but to administrative processes, including delays in subsidy disbursement, limited visibility of application status, billing queries and uncertainty regarding net metering. These issues were particularly evident during the initial months after commissioning, when consumers were still becoming familiar with the scheme.

Successful installations also have a strong demonstration effect. Several consumers reported that neighbours and relatives approached them after seeing lower electricity bills or visiting their rooftop installations. Existing consumers have become an important source of information for prospective applicants, helping them understand system sizing, vendor selection and the application process. This informal exchange has extended awareness of rooftop solar beyond formal government outreach.

Sustaining this momentum will depend as much on the quality of the consumer experience after installation as on financial incentives. Timely subsidy disbursement, transparent communication and responsive after-sales support will be essential to maintaining consumer confidence and encouraging wider adoption.

CASE STUDY: Malaya Ranjan Pal, Cuttack

When Malaya Ranjan Pal returned to Cuttack from New Delhi in 2024, he began looking for ways to reduce his household's recurring expenses. With a home loan, children's education costs, and rising electricity bills that frequently crossed Rs 4,000 a month and touched nearly Rs 10,000 during summer, managing household finances became increasingly challenging. Rooftop solar seemed like a practical solution, but like many first-time consumers, he was initially uncertain about the investment.

After discussing the scheme with a friend working in the solar sector and assessing the potential savings, he decided to install a 3-kW rooftop solar system under PM Surya Ghar in November 2024 using a bank loan. The installation, inspection and commissioning were completed without major difficulty, reinforcing his confidence in the programme. However, the post-commissioning experience revealed several implementation gaps that programme statistics do not show.

The most significant issue was the delay in receiving the state subsidy. Although the Odisha Renewable Energy Policy provides for subsidy disbursement within 30 days of commissioning, the amount was credited only after six to seven months. During this period, he had little visibility into his application status. Neither the National Portal nor the DISCOM portal provided adequate updates, leaving him to repeatedly follow up with the vendor and utility officials to understand when the subsidy would be released.

A second concern emerged after the smart net meter was installed, when one monthly electricity bill was significantly higher than expected. Initially, the family suspected that the new meter was recording incorrectly. A detailed utility inspection later found that an existing earthing fault in the household wiring, not the rooftop solar system or the smart meter, caused the higher consumption. Once the wiring was repaired, electricity consumption and billing returned to expected levels. The experience highlighted the importance of prompt technical support and clear communication, particularly during the initial months when consumers are still developing confidence in the technology.

Over time, Malaya became more familiar with the system by regularly using the DISCOM's *Mitra* application to monitor daily electricity generation, exports and consumption. As his understanding improved, he began shifting energy-intensive activities such as pumping water and running major appliances to daylight hours, allowing a greater share of household demand to be met directly by solar generation. The reduction in monthly electricity bills reinforced his confidence in the investment.

Satisfied with the performance of the system, he subsequently expanded the installed capacity and has recommended rooftop solar to neighbours and relatives, several of whom have since installed systems of their own. He is also considering purchasing an electric vehicle, viewing rooftop solar as a way to offset future charging costs in addition to reducing household electricity expenditure.



Malaya Ranjan Pal in front of his 6-kWp solar rooftop system in Cuttack, Odisha

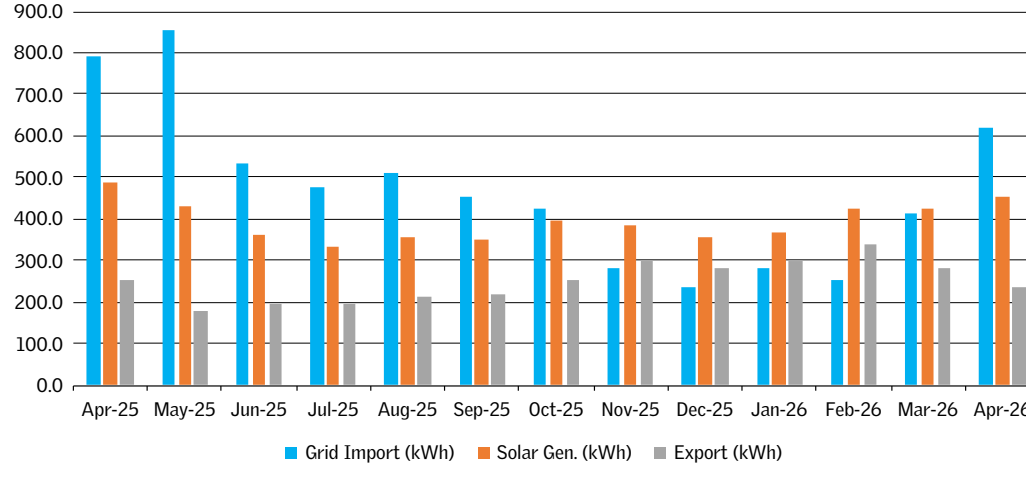
Malaya's experience illustrates that the financial case for rooftop solar under PM Surya Ghar is compelling. At the same time, it shows that delays in subsidy disbursement, limited visibility of application status and gaps in consumer support can undermine user confidence even after successful installation. As rooftop solar adoption expands, improving the post-installation consumer experience will be as important as simplifying the application process.

Quantifying the consumer experience

Electricity bills in Malaya, Cuttack, with a 3-kWp rooftop solar (RTS) system demonstrate the tangible benefits of net-metered rooftop solar. Monthly billing records show that while household electricity demand remained relatively stable, on-site solar generation met a significant share of the requirement, reducing dependence on grid electricity. Over the study period, the system generated 330-490 kWh of electricity every month, with 180–340 kWh exported to the grid after meeting daytime household demand. Consequently, monthly grid imports declined substantially and net billable units remained well below total household electricity consumption.

The chart highlights three clear trends. First, grid electricity imports declined markedly after the summer months, falling from around 790–860 kWh in April–May 2025 to around 240–280 kWh during November 2025 to February 2026, indicating that rooftop solar met a substantial portion of the household's electricity demand. Second, solar generation remained relatively consistent throughout the year, typically ranging between 350 and 450 kWh per month, demonstrating stable system performance. Third, a significant proportion of the generated electricity was exported to the distribution network, particularly during the winter months when household daytime demand was lower. Monthly exports exceeded 300 kWh in January and February 2026, reflecting the effectiveness of net metering in monetizing surplus generation (see *Graph 2: Monthly grid import, solar generation and export [kWh]*).

Graph 2: Monthly grid import, solar generation and export (kWh)



Source: CSE analysis of a consumer's monthly electricity bill

Overall, the case illustrates how a modest 3 kWp rooftop solar system can significantly reduce grid dependence while generating surplus electricity for export. Rather than relying entirely on the utility supply, the consumer increasingly met electricity needs through self-generation, with excess energy credited under net metering. The result was a substantial reduction in billable units and electricity expenditure, demonstrating the financial and operational benefits of residential rooftop solar under Odisha's net-metering framework (see *Annexure 3*).

CASE STUDY: Dr Debabrata Pattnaik, Sambalpur

For Dr Debabrata Pattnaik, a medical practitioner in Sambalpur, installing rooftop solar was not simply a way to reduce electricity bills. It was part of a broader decision to make his household's energy use more efficient while preparing for future electricity demand.

In May 2026, he installed a 3 kW rooftop solar system under PM Surya Ghar. Although his existing household electricity consumption could have been met with a smaller installation, he deliberately chose a larger system after considering his future plans to use an electric two-wheeler. Rather than sizing the system around present demand alone, he viewed rooftop solar as a long-term investment that would support both household electricity consumption and electric mobility.

His assessment was based on a simple economic calculation. Electricity generated during the day would meet household demand, while surplus generation exported to the grid through net metering would offset the electricity consumed later for charging his newly purchased electric two-wheeler. In effect, the rooftop solar system would reduce not only his monthly electricity bill but also a significant portion of his transport expenditure by replacing petrol with solar-generated electricity.

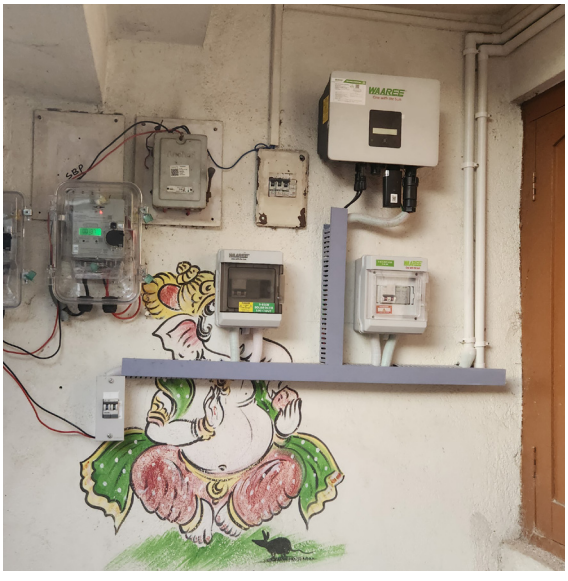
For Dr Pattnaik, the decision also reflected confidence in the long-term economics of rooftop solar. The Central Financial Assistance reduced the upfront investment substantially, while the expected savings over the system's lifetime made the larger installation financially viable. He regarded the additional capacity as an investment in future energy needs rather than an unnecessary expense.

His experience highlights an emerging trend among residential consumers. Rooftop solar systems are increasingly being designed not only to meet current household demand but also to accommodate future loads such as electric vehicles, induction cooking and other electrified appliances. As residential energy consumption evolves, system sizing decisions are likely to become more forward-looking.

The case also raises an important policy consideration. Current subsidy provisions are primarily designed around existing household electricity demand. As electric mobility and the electrification of household energy use expand, future programme design may need to recognize changing consumption patterns and provide greater flexibility for consumers investing in larger rooftop solar systems.

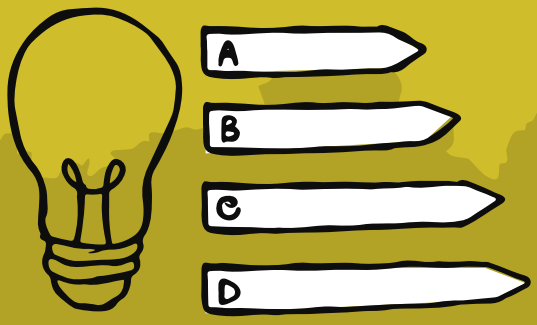


Informed prosumer with their EV in Sambalpur



Solar meter installed in Dr Pattnaik's house in Sambalpur

Dr Pattnaik's experience shows that rooftop solar is becoming part of a broader household energy transition. For an increasing number of consumers, the technology is no longer viewed only as a means of reducing electricity bills but as a foundation for meeting future energy needs in a cleaner and more economical manner.



JHARKHAND—HIGH FISCAL INCENTIVES AMIDST OPERATIONAL STAGNATION

High residential tariffs support rooftop solar economics, but 200 units of free monthly electricity restrict adoption largely to higher-consuming households.

Despite adequate vendor capacity, weak JBVNL coordination, limited review meetings and insufficient training impede implementation and reduce installation efficiency.

Bidirectional meter delays of three to six months, coupled with outdated billing software, remain major bottlenecks delaying commissioning and accurate billing.

Inconsistent bank lending practices, weak inter-agency coordination and unresolved billing grievances undermine consumer confidence despite satisfactory technical performance and available collateral-free loans.

Jharkhand offers many of the conditions that typically encourage rooftop solar adoption. Consumption beyond the first 200 free units a month is billed at around Rs 7.20 per unit for rural consumers and Rs 7.40 for urban consumers, a marginal tariff among the highest in eastern India, one that should make the savings from rooftop solar particularly attractive for higher-consuming households. Supply also remains unreliable in many parts of the state. During field visits, households in Ranchi reported routine outages of three to four hours, and disruptions lasting up to two or three days following summer storms. JBVNL's own service improvement targets also indicate that power reliability remains a challenge. Even by FY2030–31, the utility aims to reduce average outages to 2.8 hours in urban areas and 3.4 hours in rural areas, suggesting interruptions will remain significant.[21]

Despite these conditions, deployment has remained limited. By June 2026, only 24.9 per cent of applications registered on the National Portal had resulted in commissioned rooftop solar systems. Part of the explanation lies in the tariff structure itself. Because the first 200 units each month are free under Mukhyamantri Urja Khushhali Yojana, many households stay within this slab and pay little or no electricity bill, leaving them little financial incentive to invest in rooftop solar, regardless of how high the tariff runs beyond it. The remaining barriers are institutional: delays in inspections and meter conversion, inconsistent banking processes, limited coordination between stakeholders, and the absence of structured grievance resolution have slowed the transition from application to commissioning. The sections that follow examine each of these in turn.

3.1 JREDA: The state nodal agency

The Jharkhand Renewable Energy Development Agency (JREDA) is the state's nodal agency for renewable energy. Its mandate extends beyond rooftop solar to include utility-scale solar, PM-KUSUM, solar street lighting and the solarization of government and institutional buildings. Residential rooftop solar under PM Surya Ghar forms only one part of this broader portfolio.

Within this mandate, JREDA's role in implementing PM Surya Ghar is largely facilitative rather than operational. The agency coordinates among departments, disseminates information about the scheme and provides access to the National Portal through its website. It does not process applications, conduct inspections or issue net metering approvals. These functions rest primarily with Jharkhand Bijli Vitran Nigam Limited (JBVNL), the state's distribution utility, which handles application processing, technical inspections, net metering, commissioning and subsidy-related activities.

This division of responsibility has a practical consequence. Because JREDA's mandate stops short of operational execution, it has limited visibility into bottlenecks that emerge after a consumer submits an application. Delays related to inspections, meter replacement, commissioning and grievance resolution occur within JBVNL's domain, outside JREDA's direct administrative reach. As a result, the agency that sets policy direction for rooftop solar in Jharkhand is not the same agency positioned to identify or resolve the operational frictions that determine whether that policy translates into commissioned systems. The following sections examine this gap between policy formulation and implementation oversight, beginning with JBVNL's role in the consumer's journey from application to commissioning.

3.2 The DISCOM

Jharkhand Bijli Vitran Nigam Limited (JBVNL) plays a central role in implementing PM Surya Ghar. Every residential rooftop solar application passes through the utility at multiple stages, including technical feasibility assessment, site inspection, bi-directional meter installation, commissioning, and integrating the consumer into the billing system. Consequently, the efficiency of these processes directly affects the pace of rooftop solar deployment across the state.

Discussions with DISCOM officials in Ranchi highlighted several operational constraints. Much of Jharkhand's distribution infrastructure was developed for one-way electricity supply and was not designed to accommodate large-scale distributed generation. In several areas, transformers are already operating close to their rated capacities, while substations require upgrades to support increasing levels of rooftop solar integration. Officials also pointed to shortages of technical staff, with much of the field workforce engaged through outsourced arrangements. These resource constraints limit both routine implementation activities and consumer outreach.

In response to growing distributed generation, DISCOM officials expressed a preference for hybrid rooftop solar systems with battery storage, arguing that batteries reduce reverse power flow by increasing household self-consumption. However, they also acknowledged that PM Surya Ghar does not cover battery systems. The additional investment substantially increases installation costs, placing such systems beyond the reach of most residential consumers.

Field interactions with vendors identified another operational gap affecting implementation. Unlike Odisha, where DISCOMs hold regular review meetings with empanelled vendors to monitor progress and resolve operational issues,

JBVNL lacks a structured mechanism for periodic engagement. Vendor meetings are organized only occasionally, and participants reported that many of the same issues remain unresolved across successive meetings. The absence of a regular review process has weakened coordination and delayed the resolution of implementation bottlenecks.

Several operational issues emerged consistently during field visits:

- **Delays in bi-directional meter installation:** Vendors reported that meter replacement frequently takes three to six months after installation, with some cases extending to nearly 180 days. The absence of defined timelines prolongs commissioning and delays consumer benefits.
- **Delayed integration with the billing system:** Even after meter installation, some consumers continue to receive conventional electricity bills because their connections have not been updated in the billing software to reflect rooftop solar generation.
- **Limited grievance resolution mechanisms:** Consumers and vendors rely on informal channels, including WhatsApp groups, portal messages and personal contacts with utility officials, to resolve pending cases. There is no publicly defined grievance redress mechanism with prescribed timelines for resolution.
- **Limited institutional engagement with vendors:** Regular review meetings with empanelled vendors are absent, reducing opportunities to identify common implementation challenges and resolve them in a time-bound manner.

Most of these constraints do not require changes to the scheme's design. They relate instead to operational management within the utility. Introducing defined service timelines, strengthening coordination with vendors and establishing a structured grievance redress mechanism would significantly improve the consumer experience and increase the rate at which applications are converted into commissioned rooftop solar systems (see *Box: What is bi-directional metering*).

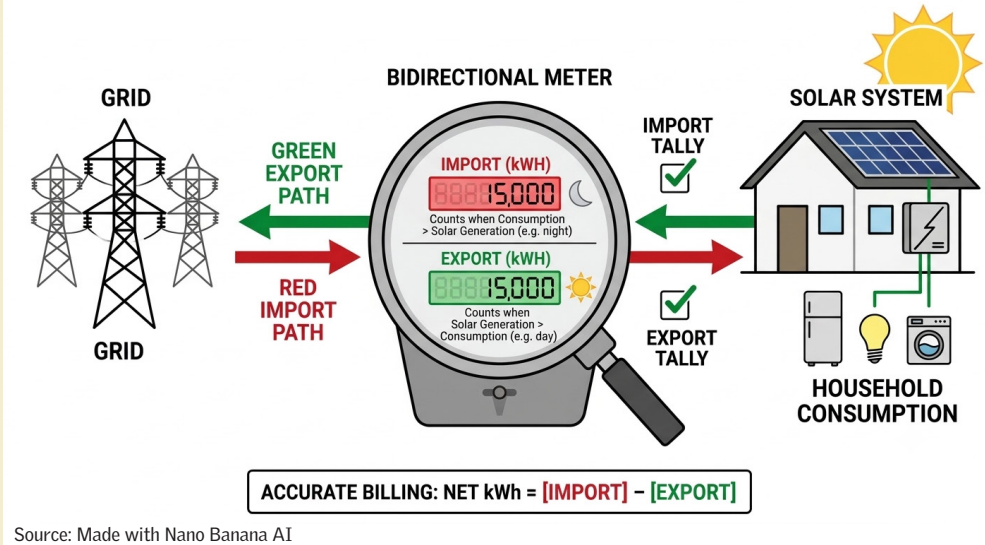
3.3 The bi-directional meter conversion

In Jharkhand, meter conversion has emerged as one of the largest operational bottlenecks in implementing PM Surya Ghar. Across discussions with consumers, vendors and DISCOM officials, delays at this stage were consistently identified as the primary reason for the slow transition from completed installations to commissioned systems. While the rooftop system itself may be installed within a few weeks, consumers often wait three to six months for the bi-directional meter to be installed, with some cases documented during the field assessment extending to nearly 180 days.

WHAT IS BI-DIRECTIONAL METERING?

A bi-directional meter measures the flow of electricity in both directions between a rooftop solar system and the grid. When the rooftop solar system generates more electricity than the household consumes, the surplus is exported to the grid and recorded by the meter. When solar generation is insufficient, such as at night or during cloudy weather, electricity is imported from the grid instead. The meter records both import and export separately, enabling billing under the net metering framework.

Under PM Surya Ghar, replacing the existing electricity meter with a bi-directional meter is a mandatory step before a rooftop solar system can be commissioned. Until the new meter is installed and integrated with the DISCOM's billing system, consumers cannot receive credit for surplus electricity exported to the grid, even if the system itself is fully installed and technically ready to operate.



Source: Made with Nano Banana AI

These delays carry consequences beyond commissioning. Consumers remain unable to export surplus electricity or realize the expected savings from their systems. Subsidy disbursement is also delayed, since commissioning cannot be completed until meter conversion is finished. Vendors, meanwhile, face longer payment cycles and higher working capital requirements, which limits their ability to take on new installations.

Field interactions suggest that the underlying issue is not the availability of meters, but the absence of defined service timelines and a structured workflow for meter replacement. Consumers and vendors often have little visibility into application status once installation is complete, leading to repeated follow-ups with local utility offices.

A related issue concerns integration of the new meter with the DISCOM's billing system. In several instances, consumers continued to receive conventional electricity bills even after the bi-directional meter had been installed, because the billing software had not been updated to recognize the connection as a rooftop solar consumer. As a result, exported electricity was either not reflected correctly or appeared only in later billing cycles, confusing consumers and reducing confidence in the scheme.

In Jharkhand's experience, bi-directional meter conversion is not merely a technical requirement but an administrative milestone that determines when consumers begin to realise the benefits of rooftop solar. Defined timelines for meter installation, stronger coordination between field offices and billing teams, and regular status updates for consumers would meaningfully reduce commissioning delays and improve overall implementation of PM Surya Ghar.



PM Surya Ghar consumer in Ranchi, unable to avail benefits due to non-conversion of bi-directional meter

3.4 The vendor ecosystem

Jharkhand has a sufficiently large number of empanelled vendors under PM Surya Ghar. Still, field interactions indicate that the challenge lies less in the number of vendors than in the operating environment in which they work. Vendors across Ranchi, Bokaro and Khunti consistently reported that consumer demand exists and interest in rooftop solar is growing. However, long commissioning timelines, delays in meter conversion, and a lack of structured coordination with the DISCOM have increased business uncertainty and slowed market expansion.

Unlike Odisha, where DISCOMs hold regular review meetings with empanelled vendors, Jharkhand lacks an institutional mechanism for continuous engagement. Vendor meetings are organized only occasionally, with no fixed schedule or structured follow-up. Vendors reported that the same operational issues are raised repeatedly without a defined process for tracking or resolving them. This has reduced installer confidence and limited opportunities to improve implementation through regular feedback.

Working capital is another challenge for vendors. They pay for equipment, installation and labour before projects are commissioned and subsidy payments come through. Delays in meter installation and commissioning stretch out this waiting period, which is hard on smaller firms with limited funds. As a result, many vendors can only handle a few projects at a time, even when consumer demand exists.

Vendors also have to deal with consumer misinformation about smart meters, most of which has nothing to do with rooftop solar itself. Some consumers think on-grid solar systems work like backup power and are confused when electricity goes out during a power cut. News reports about rising bills after smart meter installation, unrelated to rooftop solar, have made people distrustful of meters in general. This has led some consumers, and occasionally vendors, to suspect that inverters are showing inflated generation numbers. The meters work correctly. The problem is that people do not understand how they work, and vendors are often left to clear up this confusion on their own.



Rooftop system in Bokaro showing structural gaps in installation quality: a weak, improvised mounting frame and absence of a lightning arrester

The assessment also found that vendors do more than install systems. They help consumers register on the National Portal, prepare documents, apply for bank loans, follow up with the DISCOM on inspections and meter replacement, and handle post-installation questions. Vendors have become the main point of contact between consumers and the agencies involved, adding a burden beyond their technical role.

Field interactions found no shortage of technical capability among the state's active vendors. The main constraints, however, are implementation delays and weak institutional coordination. Regular review meetings between JBVNL and empanelled vendors, along with better tracking of pending cases during commissioning, would go some way towards a more predictable business environment for rooftop solar deployment.

3.5 The banking channel

PM Surya Ghar provides collateral-free loans of up to Rs 2 lakh through participating public sector banks, making access to affordable finance a key element of the scheme. In Jharkhand, however, field interactions suggest that the loan product's availability has not translated into consistent branch-level access. While the financing framework is well defined, its implementation remains uneven across banks and districts.



Indian Overseas Bank, Khunti branch, the only bank in the region to execute a rooftop solar loan

Discussions with bank officials revealed that awareness of the scheme varies considerably across branches. Larger public sector banks process relatively more rooftop solar loans, while many branches have handled only a few applications and remain unfamiliar with operational procedures. In several cases, branch officials were learning about the scheme's provisions during interactions with the CSE team, indicating the need for more structured capacity building.

A senior officer at a Punjab National Bank branch in Ranchi estimated that more than half of the rooftop solar loan applications received by the branch do not progress to disbursement. The primary reasons are not related to consumer willingness but to documentation and processing challenges. Loan applications often remain incomplete, supporting documents vary across branches and communication between consumers, vendors and banks is inconsistent.



PNB H.E.C, Dhurwa branch, Ranchi, Jharkhand



Union Bank, Khatal More branch, Ranchi

Field interactions identified several recurring challenges within the banking system:

- **Limited visibility of the loan product:** Although the scheme provides collateral-free loans, many branch-level staff are unfamiliar with the product, resulting in inconsistent guidance to applicants.
- **Conventional underwriting practices:** Documentation requirements such as income tax returns, formal income proof and credit history make it difficult for farmers, small traders and consumers working in the informal sector to access finance, despite being eligible under the scheme.
- **Property-related constraints:** Consumers living in apartments or on leasehold land, including Central Coalfields Limited (CCL) housing in Bokaro, often face additional difficulties because ownership and rooftop access are not straightforward.

- **Inconsistent subsidy adjustment:** Bank branches follow different practices when the Central Financial Assistance is credited to the loan account. In the absence of standard operating procedures, borrowers receive inconsistent information on loan adjustment and EMI recalculation.
- **Lack of identification in subsidy transfers:** Subsidy credits often reach banks without clear transaction details identifying the beneficiary or scheme, requiring manual reconciliation and delaying account settlement.
- **Limited consumer involvement in the loan process:** Vendors frequently complete documentation on behalf of consumers, enabling faster processing but leaving many borrowers with only a partial understanding of their loan terms and repayment obligations.

These issues do not indicate a lack of financial products but rather inconsistencies in implementation across the banking network. Standardized operating procedures, branch-level training and improved coordination between banks, vendors and the DISCOM would make the financing process more predictable and reduce delays for consumers seeking rooftop solar loans.

3.6 Consumer base

Jharkhand's residential rooftop solar market differs from the other states in this study because of the state's free electricity policy. Domestic consumers receive 200 units of free electricity every month. DISCOM officials in Ranchi informed CSE that around 37 lakh of the state's nearly 55 lakh domestic consumers fall entirely within this free slab, meaning their monthly bill is zero, leaving only 17–18 lakh consumers who use more than 200 units a month as realistically relevant to PM Surya Ghar. This estimate is broadly corroborated by data on record with the Jharkhand State Electricity Regulatory Commission (JSERC), whose March 2026 tariff order for JBVNL cites a Government of Jharkhand submission that around 38.41 lakh of the state's roughly 52 lakh domestic consumers, close to three-quarters, benefit from the free electricity scheme. Many of the remaining eligible consumers use only slightly more than 200 units a month, which weakens the case for rooftop solar and lengthens the payback period.

Vendors confirmed this pattern in the field. A leading installer in Ranchi estimated that in a typical rural settlement of 200–300 households, only four or five regularly consume more than 200 units a month. For the rest, free electricity already covers their needs, leaving little financial reason to invest in rooftop solar.

The free electricity scheme is a welfare measure and sits outside PM Surya Ghar's scope, but it shapes the size of the market the scheme can reach. With a smaller

pool of consumers who stand to benefit, delays in commissioning, financing or subsidy disbursement carry more weight than they would in a state with a larger addressable market.

Within this already narrow pool, Jharkhand also does not offer a state-level top-up subsidy beyond the central assistance available under PM Surya Ghar. Vendors, bankers and DISCOM officials consistently identified this as a further constraint on consumer interest, particularly in districts where awareness of rooftop solar is still low. A state top-up tends to do more than reduce the upfront cost: it gives vendors and local officials something concrete to promote, a visible reason to bring the scheme up in conversation. Without it, outreach in Jharkhand depends almost entirely on individual vendor initiative and word of mouth, with no independent state-level push to draw the remaining eligible consumers toward the scheme.

The experience of one of the state's earliest adopters shows how operational issues continue to shape consumer confidence even after a rooftop solar system is successfully installed.

CASE STUDY: Deepak Devi, Bokaro—An early adopter

Deepak Devi and her husband, Pramod Kumar, were among the early adopters of PM Surya Ghar in Bokaro. After retiring from his career as an engineer, Pramod Kumar began exploring ways to reduce the household's electricity expenditure as the family's energy consumption increased. He first learned about PM Surya Ghar through a television advertisement and, before proceeding, compared the empanelled vendors operating in Bokaro. The family eventually selected a vendor supplying Tata equipment, believing that an established manufacturer would provide greater reliability and better after-sales support. Their rooftop solar system was installed in late 2024.

The system performed as expected from the outset. Electricity generation closely followed seasonal variations, with higher output during sunnier months and lower generation during the monsoon. However, their billing records revealed an issue that emerged after commissioning, not during installation.

In August 2025, the export reading on the electricity bill dropped to zero, even though the rooftop solar system continued to generate electricity. When the next billing cycle was issued, the accumulated export units from the previous months appeared together as a much larger credit. The issue was not with the rooftop solar system or the meter itself, but with the billing system, which had failed to record exported electricity correctly during one billing cycle. For the family, the missing export data created uncertainty about whether the system was working properly.



Deepak Devi—Early adopter of PM Surya Ghar scheme in Bokaro

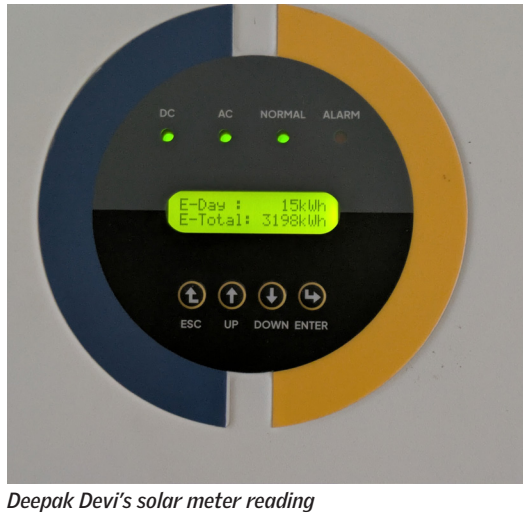
A second issue persisted across successive bills. Although the household consistently accumulated credits by exporting surplus electricity to the grid, the payable amount remained negative month after month, with the credit simply carried forward to subsequent billing cycles. The family received neither an adjustment on future bills nor a clear settlement mechanism. While the accounting reflected the exported electricity, the practical benefit of those accumulated credits remained unclear.

Despite these issues, the family's confidence in rooftop solar did not diminish. After observing the system's performance over the first year, they expanded the installation to 3.3 kW to meet the household's growing electricity demand. They are also considering installing a battery storage system to maintain power supply during the frequent outages that continue to affect the area. In January 2025, Deepak Devi was recognised as one of the state's early adopters of PM Surya Ghar and has since encouraged neighbours and other households to consider rooftop solar based on her own experience.

Her experience illustrates an important distinction. The rooftop solar system performed reliably and delivered the expected technical benefits. The challenges arose within the administrative systems that support it, particularly billing and settlement. As the programme expands, ensuring that billing accurately reflects energy exports and that consumers clearly understand how credits are adjusted will be essential to maintaining confidence in rooftop solar.

Quantifying the consumer experience

The electricity bills of Deepak Devi in Bokaro provide valuable insights into the performance of rooftop solar under Jharkhand's net-metering framework and, more importantly, the challenges associated with post-installation billing and settlement. Monthly billing records indicate that the household consistently relied on both rooftop solar generation and grid electricity, with grid imports generally in the range of 93–299 kWh per month. At the same time, the system regularly exported surplus electricity to the distribution network, demonstrating that the rooftop solar system was functioning effectively and generating excess energy beyond the household's daytime consumption.

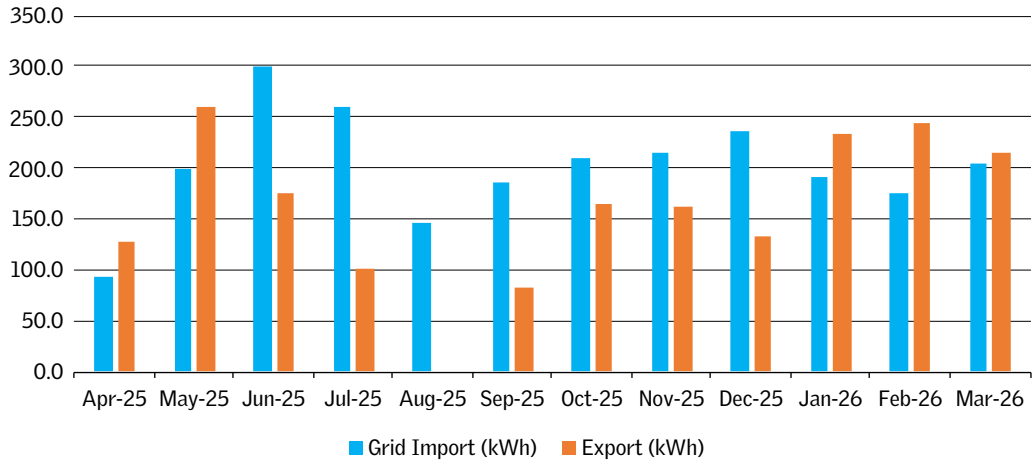


Deepak Devi's solar meter reading

The billing pattern reveals three notable trends. First, electricity exports remained significant throughout the year, typically ranging between 100 and 260 kWh per month, indicating that the system consistently generated surplus electricity for injection into the grid. Second, an administrative anomaly occurred in August 2025, when the electricity bill recorded zero exported units despite the system continuing to generate electricity normally. The export units reappeared in the subsequent billing cycle, confirming that the issue lay not with the rooftop solar system or the bi-directional meter but with the billing software's failure to record exported energy during that month. Such discrepancies create uncertainty for consumers and reduce confidence in the billing process, even when the technical performance of the system remains unaffected.

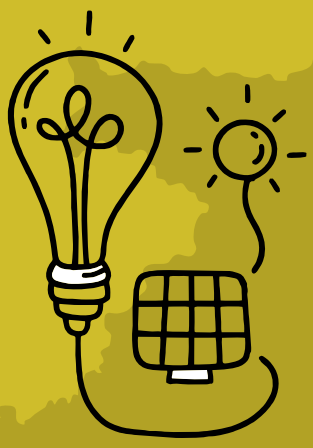
Third, despite regularly exporting surplus electricity, the accumulated credits were not settled in a manner that provided a tangible financial benefit to the consumer. Instead, excess generation continued to be carried forward as negative balances in successive bills, with no clear mechanism for adjustment or payment. This highlights an important gap in the implementation of net metering in Jharkhand. While energy accounting captured surplus generation, the settlement process lacked transparency, leaving consumers uncertain about how and when these credits would ultimately be utilized (see *Graph 3: Monthly grid import and export*).

Graph 3: Monthly grid import and export (kWh)



Source: CSE analysis of a consumer's monthly electricity bill

Overall, Deepak Devi's experience demonstrates that the rooftop solar system itself performed reliably and generated substantial surplus electricity throughout the year. The principal challenges arose from the administrative interface between rooftop solar and the billing system, rather than from the technology itself. As PM Surya Ghar expands across Jharkhand, improving the accuracy of export recording, ensuring timely credit settlement, and providing greater transparency in net-meter billing will be essential for sustaining consumer confidence and encouraging wider adoption of residential rooftop solar (see *Annexure 4*).



CHHATTISGARH—ADMINISTRATIVE LEADERSHIP DRIVING ROOFTOP SOLAR DEPLOYMENT

District collectors, CSPDCL and CREDA prioritize PM Surya Ghar through regular reviews, coordinated implementation, active monitoring and stronger district-level accountability.

Daily installations rose from 50 to 300–400, while commissioning timelines in Raipur and Durg declined to nearly 48 hours.

CREDA's decentralized energy experience strengthens procurement, quality assurance, technical support and coordination, while vendor oversight has reduced reported fraud cases substantially.

Chhattisgarh's ULA model targets 1 lakh PMAY households, reducing consumer contributions to Rs 1,500; planned storage supports future renewable integration.

Chhattisgarh has emerged as one of the fastest-improving rooftop solar markets under PM Surya Ghar. Although the state started from a relatively modest base, installations have increased sharply over the past year. By June 2026, daily applications consistently exceeded 1,000, and daily installations had risen from around 50 during the early phase of the scheme to nearly 300–400. At the time of fieldwork, approximately 68,000 households had installed rooftop solar systems under PM Surya Ghar, alongside a smaller deployment of solar pumps under PM-KUSUM.

Unlike states where rapid growth has been driven primarily by favourable tariffs or generous financial incentives, Chhattisgarh's recent progress reflects improvements in programme implementation. Residential electricity tariffs remain relatively low, leading to longer payback periods than in western India. A substantial proportion of the state's population also lives in forested, mining or dispersed rural areas, where consumer outreach and service delivery are inherently more challenging. In urban centres such as Raipur, Durg, Bhilai and Bilaspur, multi-storeyed residential buildings further limit the addressable market because rooftop ownership and technical feasibility often require collective decisions by housing societies.

These structural constraints make Chhattisgarh's recent progress particularly noteworthy. Rather than relying on changes in consumer economics, the state has focused on strengthening implementation. District collectors have taken an active role in monitoring PM Surya Ghar, Chhattisgarh State Power Distribution Company Limited (CSPDCL) has streamlined commissioning processes, and there is an active plan to expand the ULA model. Together, these measures have improved coordination between implementing agencies and accelerated the transition from application to installation.

4.1 CREDA

The Chhattisgarh Renewable Energy Development Agency (CREDA) is the state's nodal agency for renewable energy and has played a central role in expanding decentralized energy access across Chhattisgarh. Over the years, the agency has implemented programmes covering solar pumps, solar street lighting, off-grid electrification and institutional solarization, building considerable technical and administrative experience in delivering renewable energy projects across the state.

This experience has provided a strong institutional foundation for the implementation of PM Surya Ghar. While day-to-day execution of residential

rooftop solar rests primarily with the distribution utility, CREDA continues to support the programme through policy coordination, technical guidance and inter-departmental collaboration. The agency also plays an important role in aligning state initiatives with the objectives of the central scheme and facilitating coordination between government departments and implementing agencies.

Field interactions suggest that CREDA's long experience in decentralized solar has strengthened the state's overall implementation ecosystem. Programmes such as the Saur Sujala Yojana established systems for procurement, quality assurance, installation and after-sales support across the state. These institutional capabilities have helped create an enabling environment for the rapid expansion of residential rooftop solar.

Unlike states where implementation depends primarily on individual institutions, Chhattisgarh's approach reflects closer coordination between CREDA, CSPDCL and the district administration. CREDA provides the policy and technical foundation, while implementation is driven through the distribution utility and supported by active administrative oversight at the district level. This coordinated approach has contributed to the state's recent improvement in rooftop solar deployment.

4.2 CSPDCL: The distribution utility

Chhattisgarh State Power Distribution Company Limited (CSPDCL) is the principal implementing agency for PM Surya Ghar in the state. It is responsible for processing applications, conducting technical feasibility assessments, installing bi-directional meters, commissioning rooftop solar systems and integrating consumers into the billing system. As in the other states examined in this study, the pace of rooftop solar deployment depends largely on the efficiency of these operational processes.

Field interactions indicate that CSPDCL has adopted a more proactive implementation approach over the past year. Dedicated monitoring of applications, closer coordination with vendors and regular follow-up at the field level have reduced commissioning timelines and contributed to the sharp increase in installations. Officials attributed much of the recent progress to stronger institutional coordination and attention by administration rather than changes in the policy framework itself.



Executive Engineer CSPDL Sanjay Khandelwal, DISCOM officials and vendors met with CSE to discuss the progress of PM Surya Ghar

One of the most significant developments has been the active involvement of district collectors in programme implementation. Rather than limiting their role to administrative oversight, district administrations have monitored progress, coordinated with local utility offices and helped resolve bottlenecks affecting installations. This has strengthened accountability across implementing agencies and accelerated decision-making, particularly in districts where rooftop solar deployment had previously been slow.

CSPDCL has also begun expanding the Utility-Led Aggregation (ULA) model across all 33 districts of the state. The model is intended to reduce the upfront financial burden on consumers, standardize procurement and simplify the installation process for households that may otherwise find it difficult to participate through the conventional vendor-led approach. The state views expanding the ULA model as an important way to increase rooftop solar adoption among middle- and lower-income households.

Despite these improvements, several operational challenges remain. Discussions with utility officials highlighted issues related to multi-storeyed residential buildings, consumer awareness and the affordability of rooftop solar systems, particularly in urban areas where apartment ownership and shared rooftops complicate installation. Officials also noted that residential electricity tariffs in Chhattisgarh like Jharkhand, remain relatively low, resulting in a longer payback period than in many western states. These factors continue to influence consumer adoption even as implementation systems improve.

Chhattisgarh's recent experience shows that administrative leadership can substantially improve programme performance without major changes to policy design. By strengthening coordination between the utility, district administration and other implementing agencies, CSPDCL has accelerated the transition from applications to commissioned systems and positioned the state among the fastest-growing rooftop solar markets under PM Surya Ghar.



The collector of Bilaspur met with CSE to discuss the current challenges and steps taken to promote residential rooftop solar

Table 4: Key features of PM Surya Ghar implementation in Chhattisgarh

Key aspect	Current status in Chhattisgarh	Implications for PM Surya Ghar
Institutional leadership	Active involvement of CSPDCL, CREDA and district collectors	Stronger monitoring and faster implementation
Utility-Led Aggregation (ULA)	Expansion planned across all 33 districts	Reduces upfront cost and improves access for low-income households
Application processing	Improved coordination and monitoring	Faster conversion from applications to installations
Meter installation and commissioning	Relatively shorter timelines than neighbouring states	Quicker consumer on-boarding
Consumer awareness	Improving but uneven across districts	Continued outreach required
Key challenge	Installation quality and workforce capacity	Greater quality assurance needed as deployment scales

Source: CSE analysis based on on-ground stakeholder consultations

Utility-Led Aggregation for PM Awas Yojana households

Beyond the conventional residential programme, CSPDCL is preparing a large-scale Utility-Led Aggregation (ULA) initiative targeting nearly one lakh PM Awas Yojana households across all 33 districts of the state. Under the proposed implementation model, CREDA will execute projects in four districts, while CSPDCL will implement the remaining 29 districts. At the time of writing, the proposal is awaiting administrative approval.

The initiative is designed to make rooftop solar affordable for lower-income households. Under the proposed structure, a 1-kW rooftop solar system costing about Rs 46,500 would require a consumer contribution of only around Rs 1,500. The remaining cost would be met through the Central Financial Assistance of about Rs 30,000 and a state subsidy of Rs 15,000, while vendor margins and financing costs would be addressed through the aggregated procurement model.

The programme targets a segment that remains difficult to reach through the conventional PM Surya Ghar model, even with subsidy support and concessional loans. However, implementing projects at this scale will also require robust quality assurance. Field discussions indicated that much of the state's installer workforce is still not formally registered, making installation quality and contractor oversight key risks as the programme expands.

NET METERING CARRY-OVER AND THE ANNUAL RESET

Under the net metering framework, surplus electricity generated by a rooftop solar system is exported to the grid and adjusted against electricity imported from the grid in subsequent billing cycles. Any unused credit is carried forward during the settlement period, allowing consumers to offset future electricity consumption.

However, these credits do not accumulate indefinitely. At the end of the annual settlement cycle, any unadjusted surplus units are reset in accordance with the applicable regulations. Field interactions showed that many consumers were unaware of this provision and expected unused credits to continue beyond the annual settlement. This often led to confusion when accumulated units disappeared after the yearly adjustment.

The issue highlights the need for better consumer awareness rather than changes in the net metering framework. Explaining the annual settlement process during installation and commissioning would help consumers understand how the billing system works and make more informed decisions about system sizing and electricity use

Table 5: Key Performance Indicators of CSPDCL under PM Surya Ghar

Recent improvements in Chhattisgarh's rooftop solar programme are reflected in its implementation indicators. While the state continues to operate within the same national framework as other states, sustained administrative monitoring and closer coordination between CSPDCL, CREDA and the district administration have improved application processing, commissioning and installation rates. The table below summarises the key performance indicators of the programme at the time of the field assessment.

Measures already working	Areas for improvement
Targeted action against fraudulent vendors: A vendor meeting in Durg following fraud complaints reduced active fraud cases from around 450 to 60–70 within four months, according to vendors interviewed during fieldwork.	**Incorrect bi-directional meter configuration:** Import and export channels are occasionally reversed during commissioning, causing exported solar electricity to be recorded as grid consumption and resulting in inflated bills. Detection currently depends on consumer complaints or vendor inspections.
Removal of dormant applications: Between late 2025 and early 2026, 20,000–30,000 inactive registrations were removed from the National Portal, providing a more accurate application-to-installation conversion rate.	**Delayed annual settlement:** Carry-over payments for surplus electricity are often credited several weeks after the regulatory timeline, while the National Portal does not allow consumers to track payment status.
Faster commissioning: In Raipur and Durg, commissioning timelines have reduced from 15–30 days to around 48 hours, supported by weekend deployment of field staff.	**Uneven district performance:** Progress varies considerably across districts. For example, Balod continues to lag behind neighbouring Durg despite similar geographic conditions.
District-level coordination: The Bilaspur District Collector convenes monthly meetings with CSPDCL officials, vendors and bank. representatives to resolve pending applications and implementation issues.	**Low compensation for surplus electricity:** The carry-over settlement rate (about Rs 3.89/kWh) provides limited financial returns for excess generation. This reflects the broader net metering framework rather than a state-specific issue.
Grid readiness: The existing high-tension network can accommodate current levels of reverse power flow. CSPDCL is revising its Supply Code to support distributed generation and planning a 125-MWh battery energy storage system (four-hour duration) to manage higher renewable integration.	**Incomplete smart meter rollout:** As of June 2026, approximately 67 per cent of consumers had smart meters installed, limiting the programme's full digital integration.

Source: CSE analysis based on on-ground stakeholder consultations

The data indicates that Chhattisgarh's recent progress has been driven less by changes in consumer economics and more by improvements in programme implementation. Although the state still trails national leaders in cumulative capacity, installation pace has accelerated significantly over the past year, suggesting that stronger institutional coordination can deliver measurable improvements even when tariff structures and market conditions are less favourable.

4.3 The vendor ecosystem

Chhattisgarh's vendor ecosystem has expanded rapidly alongside the growth of PM Surya Ghar. Field interactions indicate that the state has an adequate number of empanelled vendors, particularly in major urban centres such as Raipur, Durg and Bilaspur. Unlike Jharkhand, vendors generally did not identify consumer

demand as the primary constraint. Instead, they pointed to installation quality, workforce capacity and the ability to sustain rapid growth as the key challenges.

Vendors reported that CSPDCL has become more responsive in recent months, with faster inspections, improved coordination and shorter commissioning timelines. Regular engagement with utility officials has reduced uncertainty during implementation and enabled quicker resolution of operational issues. This has created a more predictable business environment and encouraged vendors to expand their activities.



Fire in the circuit due to usage of substandard materials in a Bilaspur household

The rapid increase in installations, however, has also exposed capacity constraints. As demand grows, vendors are finding it increasingly difficult to recruit trained installation teams. Field discussions indicated that a large proportion of technicians continue to work in the informal sector without formal registration or standardized training. While this has not yet emerged as a major constraint, maintaining installation quality will become increasingly important as deployment accelerates, particularly under the proposed Utility-Led Aggregation programme.

Several vendors also highlighted the importance of after-sales service. Residential consumers often require assistance with system monitoring, inverter settings and billing after commissioning. As rooftop solar adoption expands beyond

early adopters, post-installation support quality is likely to become a key factor influencing consumer confidence and word-of-mouth adoption.

Chhattisgarh's experience suggests that the next phase of market development will depend less on increasing the number of empanelled vendors and more on strengthening technical capacity, ensuring quality installations and improving after-sales support.

4.4 The banking channel

Compared with the other two states assessed in this study, Chhattisgarh's banking experience was generally more positive. Public sector banks demonstrated greater familiarity with PM Surya Ghar, and vendors reported fewer delays in loan processing and subsidy-linked disbursement. Nevertheless, implementation remained uneven across branches.

Consumers who met conventional lending requirements generally faced few difficulties in obtaining rooftop solar loans. However, applicants from the informal sector continued to encounter challenges in meeting documentation requirements related to income, credit history and property ownership. These issues were consistent with those observed in Odisha and Jharkhand, indicating that they reflect broader banking practices rather than state-specific constraints.



SBI Malviya Nagar branch manager with PM Surya Ghar applicants in Bhilai, Chhattisgarh

Field discussions also highlighted differences in how branches handled subsidy adjustments after commissioning. While some banks promptly credited the Central Financial Assistance against the outstanding loan amount and recalculated the repayment schedule, others continued with the original repayment plan until consumers requested clarification. Greater consistency in branch-level procedures would improve transparency and reduce consumer confusion.



PNB Gunderdehi branch, rural Chhattisgarh



Bank of Baroda, Fafadih branch, Raipur, Chhattisgarh

Overall, access to finance does not appear to be the principal constraint to rooftop solar deployment in Chhattisgarh. The loan products are available and branch-level familiarity is improving. The remaining challenge lies in ensuring a more consistent consumer experience across the banking network as application volumes continue to increase.

4.5 The consumer experience

Field interactions indicate that consumers in Chhattisgarh generally reported a smoother installation experience than those in Odisha and Jharkhand. Faster commissioning, closer coordination between CSPDCL and vendors, and active involvement of district administrations have reduced many of the delays observed in the other two states.

Consumer experiences nevertheless varied depending on technical knowledge, financing choices and the complexity of individual installations. Households that relied heavily on vendors to manage documentation and follow-up generally completed the process with limited difficulty, while consumers undertaking larger or more technically complex systems required greater engagement with both vendors and utility officials.

CASE STUDY: Dr Shahid Ahmad Khan, Bilaspur

Dr Shahid Ahmad Khan, a medical practitioner and entrepreneur in Bilaspur, installed a 6-kW rooftop solar system under PM Surya Ghar after carefully evaluating his growing electricity demand. Unlike many residential consumers, his decision was driven by both household consumption and the electricity requirements of his battery business, making system sizing a more technical exercise than a purely financial one. The electricity connection itself is registered in the name of his wife, Shahnaz Bano, with a sanctioned load of 6 kW, and the application and installation were processed against her account even as Dr Khan managed the technical and vendor-related aspects of the project.

Installation was delayed for several months, partly because of supply constraints affecting the Tata equipment he had selected and partly because he postponed the purchase after reports of a possible reduction in GST on solar components. When the anticipated policy change did not materialize, the project proceeded at the original quoted price. Dr Khan financed the installation entirely from his own resources, avoiding the loan process altogether. This enabled him to bypass many of the financing-related issues experienced by other consumers and allowed the installation to progress more quickly once equipment became available.

His three-phase electricity connection also contributed to a smoother operational experience. During field visits, vendors explained that many consumer complaints arise from single-phase installations where household loads are unevenly distributed across phases, resulting in apparent discrepancies between electricity imports and exports. The three-phase connection avoided these complications, while Dr Khan's familiarity with battery systems and inverter technology enabled him to optimise system performance from the outset.

The experience of Dr Shahid Ahmad Khan and Shahnaz Bano (wife) in Bilaspur illustrates how an informed household navigated the programme and highlights both the strengths and the remaining limitations of the current implementation framework.



Dr Shahid Ahmad Khan (centre) with his vendor (right) and a CSE researcher (left) at his 6-kW rooftop installation in Bilaspur

Although the administrative process was generally efficient, it still required regular follow-up. Dr Khan visited CSPDCL offices on several occasions to expedite pending approvals and described the system as responsive when actively pursued rather than entirely automatic. Following commissioning, he used the remote monitoring platform to track electricity generation and identify performance issues in real time. His experience also demonstrates the wider influence of early adopters. Since installing the system, neighbours, relatives and local businesses

have approached him for advice on system sizing, vendor selection and installation procedures. Anticipating increased electricity demand in the locality, he also helped augment the neighbourhood distribution transformer in coordination with CSPDCL, rather than waiting for the utility's routine investment cycle.

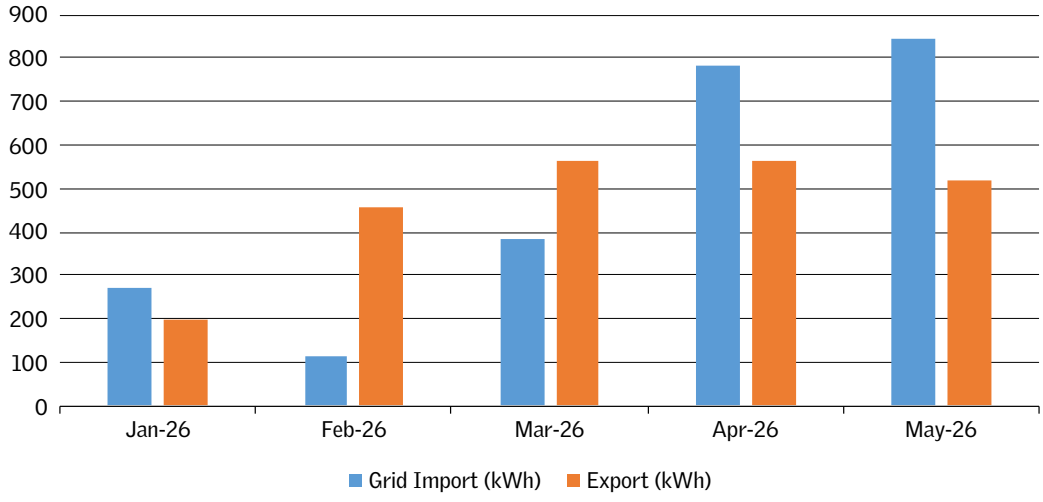
Dr Khan's experience illustrates that informed consumers can successfully navigate the programme and often become local ambassadors for rooftop solar. At the same time, it shows that technical understanding, financial capacity, and continued engagement with the implementation process still shape the consumer experience. As rooftop solar adoption expands beyond early adopters, stronger institutional support will increasingly need to provide these enabling conditions rather than relying on individual initiative.

Quantifying the consumer experience

The electricity bills recorded under Ms Shahnaz Bano's account, wife of Dr. Khan, against which his 6-kW rooftop solar system operates, demonstrate the benefits of a larger residential rooftop solar installation serving both household and commercial electricity demand. Monthly billing records indicate that the system consistently generated sufficient electricity to offset a substantial share of grid consumption, while surplus generation was regularly exported to the distribution network through net metering. Unlike several consumers encountered during the field survey, this household had no major billing discrepancies after commissioning, reflecting smoother administrative and billing systems in Chhattisgarh.

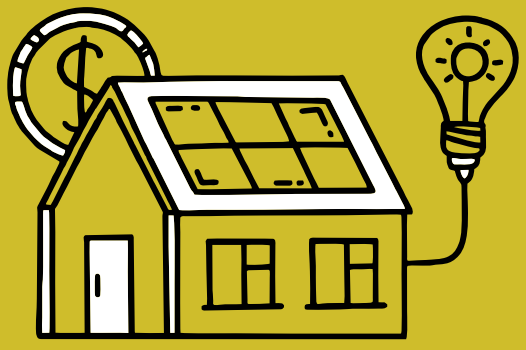
The billing pattern highlights three important trends. First, the rooftop solar system significantly reduced the household's dependence on grid electricity despite relatively high electricity consumption associated with both residential use and a battery business. The net billable units remained substantially lower than total electricity demand, demonstrating the contribution of on-site solar generation in meeting daytime loads. Second, surplus electricity was consistently exported to the grid, with net-metering credits accurately reflected in successive electricity bills. The absence of irregularities in recording exported units contrasts with the billing issues observed in Jharkhand, indicating a more reliable billing and settlement mechanism under CSPDCL. Third, the three-phase electricity connection contributed to balanced energy accounting by minimising phase-wise discrepancies between electricity import and export, resulting in more accurate billing and efficient utilization of the rooftop solar system (see *Graph 4: Monthly grid import and export [kWh]*).

Graph 4: Monthly grid import and export (kWh)



Source: CSE analysis of a consumer's monthly electricity bill

Overall, this household's experience illustrates how a well-sized rooftop solar system, combined with an efficient net-metering framework and timely administrative support, can substantially reduce electricity expenditure for consumers with relatively high electricity demand. The case also demonstrates that the benefits of rooftop solar extend beyond bill savings. Reliable billing, accurate accounting of exported electricity and transparent settlement of net-metering credits reinforce consumer confidence, encouraging early adopters such as Dr Khan and Shahnaz Bano to become local advocates for the programme and facilitate wider adoption of rooftop solar within their communities (see *Annexure 5*).



CONCLUSIONS AND RECOMMENDATIONS

PM Surya Ghar has generated demand, but conversion to commissioned systems depends on efficient state-level implementation and coordinated operational processes.

Distribution utilities are central to delivery; timelines, performance monitoring, vendor engagement and accountability can accelerate commissioning and improve conversion rates.

Consumer confidence depends on accurate billing, timely meter installation, transparent subsidy and surplus settlement, and accessible grievance redress after commissioning.

The next phase should broaden access through utility-led aggregation, shared-metering models, inclusive finance and better vendor support for underserved households.

5.1 Key findings from the assessment

PM Surya Ghar: Muft Bijli Yojana has significantly expanded India's residential rooftop solar market. Within two years of its launch, rooftop solar has evolved from a programme concentrated in a handful of states into a nationwide initiative supported by CFA, concessional finance, a common digital platform and utility-led implementation. The scheme has generated consumer demand at scale, with millions of households registering through the National Portal and the residential segment accounting for most new rooftop solar installations. Yet Odisha, Jharkhand, and Chhattisgarh show that generating demand is only the first step. Whether an application ultimately becomes a commissioned rooftop solar system depends largely on the effectiveness of state-level implementation.

Although all three states operate under the same national framework, their implementation experience has differed sharply. Odisha, Jharkhand and Chhattisgarh each took a different path to the same goal, with very different results. The reasons behind these differences form the core of this chapter's findings. Four key findings emerge from this comparison, relevant not only to these three states but to the wider rollout of PM Surya Ghar across the country.

Finding 1: Policy creates the opportunity; implementation determines the outcome

PM Surya Ghar has addressed many of the barriers that constrained residential rooftop solar in the past. It has reduced upfront costs, simplified applications and improved access to finance. Once a household applies, however, progress depends on how efficiently states implement it.

Technical feasibility approval, site inspection, vendor coordination, bi-directional meter installation, commissioning, billing integration and subsidy disbursement involve multiple institutions working in sequence. Delays at any stage slow commissioning, increase vendor costs and weaken consumer confidence. The difference between states therefore lies less in the availability of financial incentives than in the efficiency of these operational processes.

Odisha's DISCOMs earn performance-linked financial incentives tied to the capacity they add, which they are reinvesting to strengthen grid infrastructure. This gives them a direct financial stake in expansion, rather than treating PM Surya Ghar as an administrative burden layered on top of existing work. Regular engagement with vendors, dedicated implementation teams and closer monitoring have reinforced this, creating a more predictable delivery process.

Jharkhand presents a contrasting picture. Although residential tariffs beyond the first 200 units of free electricity are relatively high—Rs 7.20/kWh in rural areas and Rs 7.40/kWh in urban areas—making rooftop solar financially attractive for only 14 lakh higher-consuming households, almost 38.4 lakh of the state's 52 lakh domestic consumers receive free electricity and therefore have little incentive to invest in rooftop solar. In addition, delays in bi-directional meter installation, commissioning, and billing integration have slowed deployment, with vendors reporting waits of three to six months and some cases extending to nearly 180 days. Consumers, vendors and banks consistently identified these operational bottlenecks, not the level of financial incentive, as the more significant constraint.

Chhattisgarh illustrates a third pathway. Daily installations rose from around 50 to 300 to 400 within a year, and average commissioning time in Raipur and Durg fell from 15–30 days to about 48 hours, driven by weekend field deployments and district collectors chairing implementation reviews directly. This administrative pathway, rather than any change to the underlying policy framework, has shortened commissioning timelines and improved programme delivery.

Finding 2: Distribution utilities have become the primary implementing agencies

The assessment highlights the central role of distribution utilities in determining programme outcomes. Under PM Surya Ghar, DISCOMs are responsible for technical feasibility approvals, inspections, bi-directional meter installation, commissioning, billing integration and the processes that trigger subsidy disbursement. Their performance therefore directly influences application-to-installation conversion rates.

Where rooftop solar has been treated as a core operational programme, implementation has improved significantly. In Odisha, this ownership is reinforced by a funding structure: DISCOMs earn scheme funding tied to the capacity they add, which they can reinvest in grid infrastructure, giving them a direct financial stake in expansion rather than an added administrative burden. In Chhattisgarh, CSPDCL's introduction of regular vendor review meetings after fraud complaints in Durg cut active fraud cases from around 450 to 60 to 70 within four months, showing how utility-led accountability can directly improve programme integrity. Jharkhand's experience shows the reverse: weak utility-level coordination, visible in extended delays in meter conversion and billing integration, has slowed deployment even where incentives and consumer demand are strong.

The findings suggest that future improvements in rooftop solar deployment are likely to come from strengthening the operational capacity of distribution utilities. Clear service timelines, regular performance monitoring, and stronger accountability for commissioning would improve programme outcomes. Chhattisgarh's vendor accountability reviews and Odisha's funding-linked incentive structure offer two working models for how this could be achieved without requiring changes to the structure of PM Surya Ghar.

Finding 3: Consumer experience extends beyond installation

The assessment found that consumer satisfaction depends not only on installing a rooftop solar system but also on the quality of service after commissioning.

Across all three states, consumers were generally satisfied with the technical performance of their systems and the resulting reduction in electricity bills. The challenges identified during fieldwork were primarily administrative rather than technical. In Jharkhand, some consumers continued receiving conventional electricity bills after installation because billing software had not been updated to reflect their rooftop solar connection. In Chhattisgarh, vendors reported cases where import and export channels were reversed during commissioning, inflating bills until a consumer noticed and complained, while annual surplus settlement routinely ran weeks behind the regulatory timeline with no way to track a pending payment on the National Portal. In Odisha, inconsistent subsidy-adjustment practices across bank branches left many borrowers unable to confirm whether their EMI had actually been reduced, with some servicing loans on systems that were not yet installed.

These experiences highlight the importance of timely meter installation, accurate billing, transparent communication and responsive grievance redress. Improving these aspects of implementation is essential not only for individual consumers but also for maintaining confidence in the programme.

The assessment also shows that satisfied consumers play an important role in expanding the market. In each of the three states, early adopters became an important source of information for neighbours and relatives seeking guidance on vendor selection, system sizing and the application process. Positive consumer experiences therefore contribute directly to wider adoption through word-of-mouth awareness.

Finding 4: The next phase must expand access beyond early adopters

PM Surya Ghar has significantly expanded access to residential rooftop solar, but participation continues to be concentrated among households with suitable rooftops, clear property ownership and the financial standing to meet costs beyond the subsidy. Apartment residents, low-consumption households, consumers in remote areas, and informal-sector workers remain comparatively underserved, each for different reasons, from shared rooftop ownership to limited vendor reach and access to financing. In Jharkhand, conventional underwriting requirements, including income tax returns and formal income proof, put the scheme's collateral-free loan out of reach for eligible farmers and informal-sector consumers, even where they would otherwise qualify. In Odisha, delayed subsidy reimbursement of two to three months has squeezed vendor working capital, pushing smaller vendors out of smaller towns and peri-urban areas and narrowing access in precisely the areas already underserved.

Utility-Led Aggregation, already active in Odisha and expanding in Chhattisgarh, points to one way to close this gap. Broadening participation, not just increasing installation numbers, is likely to define the next phase of the programme.

5.2 Recommendations

The findings from Odisha, Jharkhand and Chhattisgarh indicate that PM Surya Ghar does not require fundamental redesign. The scheme already provides a sound policy framework, comprising Central Financial Assistance, a common National Portal, concessional financing and standardized technical specifications. The next phase should instead focus on strengthening implementation systems and expanding access to consumer segments the scheme does not yet reach, converting consumer interest into commissioned installations more efficiently, a priority also reflected in recent Ministry of New and Renewable Energy reviews calling for faster implementation, stronger utility participation and expanded utility-linked aggregation models.

Strengthen state-level implementation systems

The application-to-installation conversion rate should become the primary indicator for monitoring programme performance. While cumulative installation numbers indicate overall progress, they do not show where applications are delayed or why consumers fail to complete the process. Tracking conversion rates alongside the average time taken for technical feasibility approval, meter installation, commissioning and subsidy disbursement would help identify implementation bottlenecks at an early stage.

States should also institutionalize regular coordination meetings involving DISCOMs, state nodal agencies, empanelled vendors and participating banks. Odisha and Chhattisgarh's experience shows that structured engagement improves communication, resolves operational issues faster, and creates greater accountability across implementing agencies. Several states now encourage similar review mechanisms to improve programme delivery.

Clearly defined service standards should be established for every stage of implementation. Consumers should know the expected timelines for feasibility approval, meter replacement, commissioning and subsidy processing, while implementing agencies should be monitored against these benchmarks.

Improve the consumer experience

A people-friendly policy is judged most directly by what a consumer experiences after submitting an application. The consumer journey should extend beyond installation. Although the National Portal has simplified the application process, consumers still face uncertainty during commissioning, subsidy adjustments, and billing. Real-time application tracking, automated notifications, and status updates would significantly improve transparency.

Consumer education should also become an integral part of implementation. Many issues observed during the assessment, including confusion regarding net metering, annual settlement of surplus electricity and loan adjustment, stemmed from limited awareness rather than technical shortcomings. Simple consumer guides explaining billing, annual settlement and expected system performance should accompany every commissioned installation.

Grievance redress deserves the same attention. Consumers currently have little option but to rely on vendors or local utility staff when billing or commissioning issues arise. Dedicated rooftop solar helpdesks within DISCOMs, supported by defined response timelines, would give consumers a reliable channel for resolution and reduce this dependence on informal follow-up.

Strengthen the vendor and financing ecosystem

The rapid expansion of PM Surya Ghar has increased the importance of installation quality and after-sales service. While the National Portal has significantly expanded the pool of empanelled vendors, the assessment found considerable variation in technical capability and service quality.

For Utility-Led Aggregation (ULA) in rural areas, trained local women from Self-Help Groups can be engaged as village-level solar technicians to support installation, routine maintenance, basic troubleshooting, consumer awareness and after-sales service, improving system reliability while creating local green livelihoods.

Vendor empanelment should therefore be complemented by periodic performance assessment based on installation quality, consumer feedback, commissioning timelines and after-sales support. Recognizing high-performing vendors and encouraging continuous technical training would improve service quality without restricting market competition.

Banks also require greater operational consistency. Although rooftop solar loans are now widely available, branch-level implementation continues to vary. Standard operating procedures covering documentation, subsidy adjustment, EMI revision and consumer communication would improve the financing experience and reduce delays. Recent national assessments have similarly identified branch-level implementation and loan processing as important constraints affecting programme delivery.

Expand access to underserved consumers and shared housing models

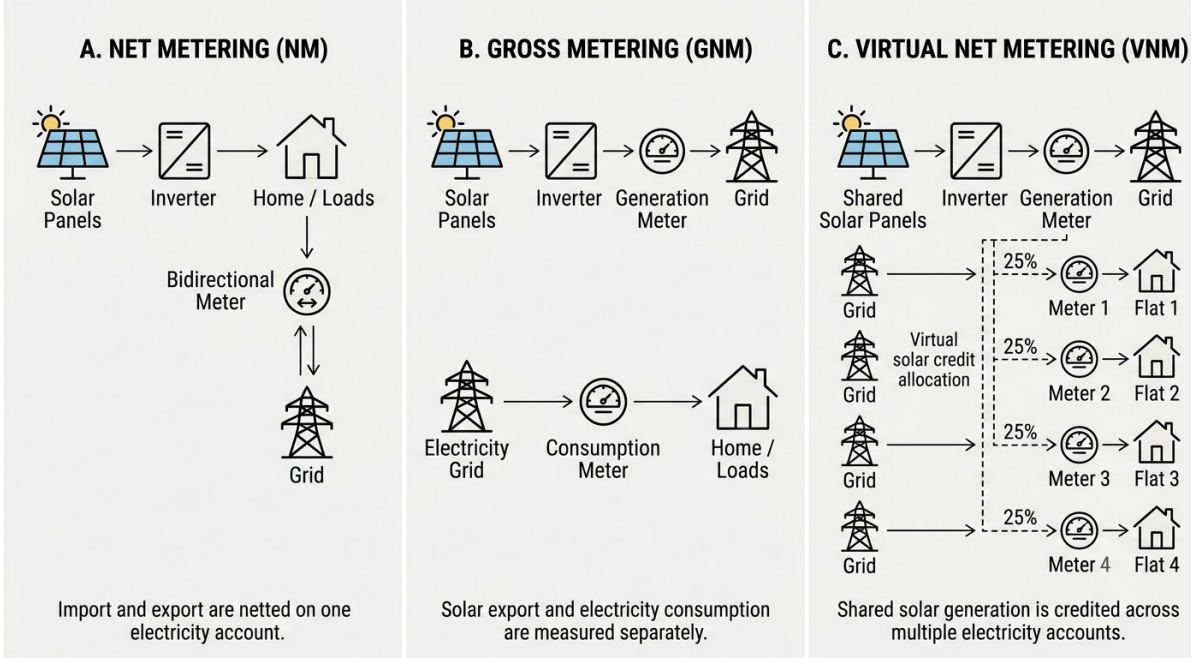
The next phase of PM Surya Ghar should focus on broadening participation rather than simply increasing installation numbers.

The assessment indicates that independent homeowners with stable incomes and formal banking relationships continue to dominate programme participation. Apartment residents, households with lower electricity consumption, informal-sector workers and consumers in remote locations remain comparatively underserved.

The Utility-Led Aggregation (ULA) models observed in Odisha and Chhattisgarh provide a promising pathway for addressing these gaps. By aggregating demand, standardizing procurement and reducing consumer contributions, these models enable utilities to reach households that private vendors often find commercially unattractive. The Ministry of New and Renewable Energy has also identified utility-linked aggregation as an important strategy for expanding rooftop solar among underserved consumer groups.

Group Net Metering (GNM) and Virtual Net Metering (VNM) offer a further route to this. GNM allows electricity generated at one location to be adjusted

Figure 1: Schematic representation of net metering (NM), gross metering (GM) and virtual net metering (VNM) arrangements

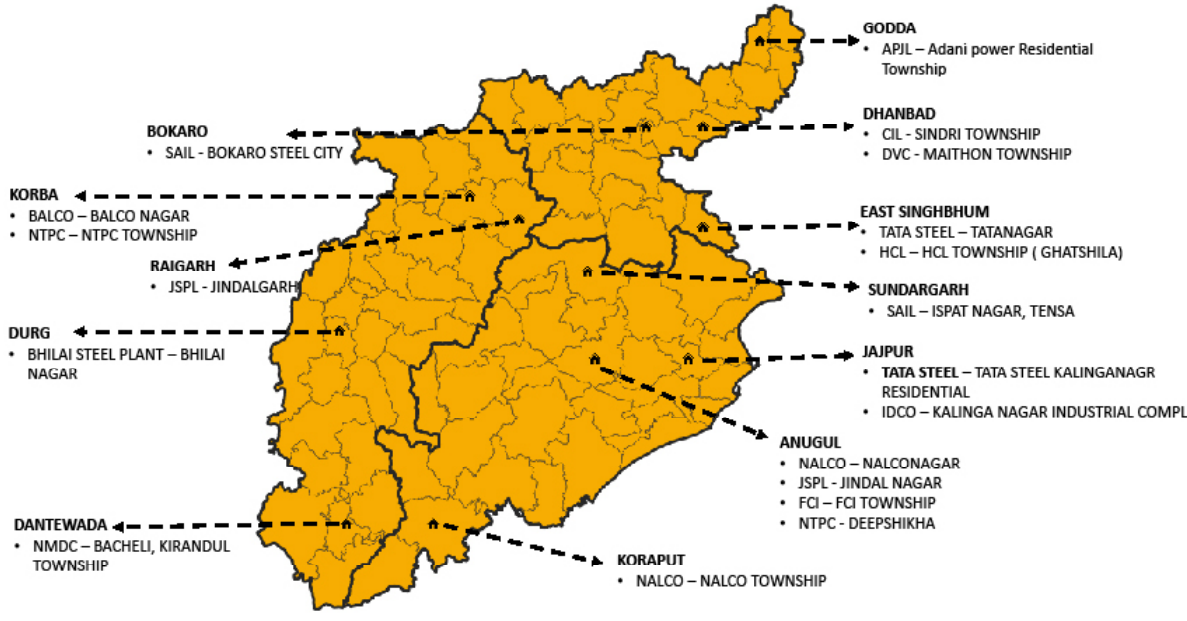


Source: Made with Nano Banana AI

against the consumption of multiple connections held by the same consumer or group, such as different flats within a housing society. VNM extends this further, allowing generation and consumption to be matched even where the two are not physically connected, provided both fall within the same distribution licensee's area. Together, these models make rooftop solar accessible to households without exclusive access to a rooftop, a growing share of urban India. States should actively promote GNM and VNM within PM Surya Ghar implementation, including simplifying regulatory approval and building DISCOM familiarity with billing and settlement procedures for shared and virtual connections (see *Figure 1: Schematic representation of net metering (NM), gross metering (GM) and virtual net metering (VNM) arrangements*).

Large residential townships built around public sector undertakings and major industrial employers, present in all three states, represent another underused opportunity. Many residents of these townships occupy housing allotted by their employer and do not hold ownership of the connection, which currently places them outside the scope of PM Surya Ghar as designed. Extending GNM and VNM models to such townships, with the employer or the managing authority acting as

Map 2: Key townships in the states of Odisha, Jharkhand and Chhattisgarh



Source: Compiled by CSE

the connecting entity, would allow residents to benefit from rooftop solar without requiring individual ownership. This would open the scheme to a substantial population currently excluded for reasons unrelated to consumption pattern or willingness to adopt (see *Map 2: Key townships in the states of Odisha, Jharkhand and Chhattisgarh*).

State-specific recommendations

Odisha

Odisha has established one of the strongest implementation ecosystems among the three states assessed. The focus should now shift from strengthening policy to improving operational efficiency and market quality.

The state should continue expanding Utility-Led Aggregation to underserved consumer segments while maintaining robust quality assurance during procurement and installation. Regular vendor review meetings, currently led effectively by TPWODL, should be institutionalized across all four DISCOMs. Greater coordination between OREDA and DISCOMs is also required to address administrative issues such as contract demand revision for institutional consumers.

Installation quality deserves increasing attention as deployment expands. Periodic technical audits, stronger monitoring of mounting structures and earthing, and state-specific vendor empanelment criteria, set ahead of any national-level revision, would improve long-term system reliability in the state's cyclone-prone districts.

Integrate rooftop solar with affordable housing programmes so that new houses are designed and financed as solar-ready from the outset. Bundling housing assistance with rooftop solar reduces installation costs, simplifies implementation and expands clean energy access for low- and middle-income households.

Operational finance also needs tightening. Faster subsidy reimbursement for vendors, particularly in smaller towns and peri-urban areas where working capital constraints are most likely to push vendors out, and standardized loan and subsidy-adjustment procedures across bank branches would close the financing gap affecting both vendors and consumers.

Jharkhand

Jharkhand's principal challenge lies in implementation rather than policy design. At around Rs 7.20 per unit, its marginal tariff beyond the free 200-unit slab is among the highest in eastern India, giving the state's 17–18 lakh higher-consuming households a genuine economic case for rooftop solar.

Defined service timelines for bi-directional meter installation and commissioning, digital tracking of pending applications, and closer coordination between JBVNL, vendors and field offices should be the immediate priority. Billing software should be updated at the point of meter conversion, not afterward, so consumers stop receiving conventional bills after commissioning.

Vendor empanelment expansion is not the priority here. The state should instead invest in formal technical training for its existing installer base.

Standardized loan procedures, alternate income verification for informal-sector applicants, and regular training for bank officials would meaningfully improve disbursement rates and reduce inconsistencies in subsidy adjustment.

The state should consider a state-level top-up subsidy targeted at higher-consuming households, alongside public awareness efforts focused specifically on this segment, since close to three-quarters of domestic consumers fall entirely within the free electricity slab and sit outside the addressable market.

The state should also support piloting battery storage models that ease reverse power flow concerns as rooftop solar penetration increases, even though these currently fall outside the scope of PM Surya Ghar.

Chhattisgarh

Chhattisgarh has demonstrated that administrative leadership can significantly improve programme performance. The state should institutionalize this model of direct district-level oversight rather than treat it as a temporary surge measure, and extend regular vendor review meetings to districts that have not yet adopted them, including Balod, which continues to lag behind neighbouring Durg despite similar geographic conditions.

The proposed Utility-Led Aggregation programme for PM Awas Yojana households should be accompanied by strong quality assurance, installer certification and independent technical inspections to ensure consistent installation standards as deployment scales.

CSPDCL should conduct a feeder- and transformer-level hosting capacity assessment now, ahead of the point where rising rooftop solar penetration makes reverse power flow management urgent, rather than relying on the state's current power-surplus position to hold automatically as adoption scales.

Completing the smart meter rollout, standardizing commissioning checks to prevent import and export channel reversal errors, and adding surplus settlement status to the National Portal would close the remaining consumer-facing gaps. The state should also examine whether the current surplus carry-over rate of about Rs 3.89 per unit is limiting the financial return enough to offset the gains from faster commissioning.

5.4 Conclusion

PM Surya Ghar has transformed India's residential rooftop solar market by creating a common national framework that combines financial incentives, digital service delivery and utility-led implementation. The experiences of Odisha, Jharkhand and Chhattisgarh demonstrate that this framework is sufficiently robust to support rapid growth. The differences observed across states arise not from variations in the scheme itself but from differences in implementation capacity.

The assessment shows that successful rooftop solar deployment depends on effective coordination between distribution utilities, state nodal agencies, vendors, banks and consumers. Financial incentives create demand, but efficient imple-

mentation determines whether that demand results in commissioned rooftop solar systems. States that have strengthened institutional coordination, reduced administrative delays and maintained close engagement with implementing stakeholders have achieved faster progress despite operating under the same national policy framework.

The findings also suggest that the programme is entering a new phase. During its initial years, the priority was to stimulate consumer demand and establish a nationwide implementation framework. Going forward, the focus should shift towards improving service delivery, strengthening market institutions and expanding access to consumer groups that remain underrepresented. Utility-led aggregation, stronger vendor oversight, improved consumer communication and more consistent banking practices can all contribute to accelerating deployment without altering the design of the scheme.

The lessons from Odisha, Jharkhand and Chhattisgarh extend beyond these three states. They demonstrate that the future of residential rooftop solar in India will depend less on introducing new policy instruments and more on improving how existing policies are implemented. As PM Surya Ghar progresses towards its national target, strengthening implementation systems at the state level will be critical to ensuring that rooftop solar becomes an accessible and reliable energy solution for households across the country. Recent national trends, including the growing contribution of Tier-II and Tier-III cities and continued emphasis on utility-led implementation, reinforce the importance of this transition from policy design to implementation excellence.

References

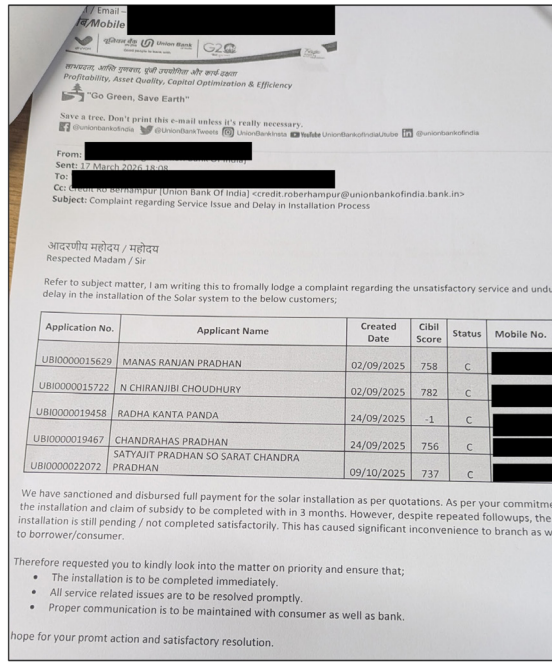
1. Energetica India (2026). *Lucknow Crosses 87,000 Rooftop Solar Installations Under PM Surya Ghar Yojana.* Retrieved 15 June 2026 from https://www.energetica-india.net/
2. Ministry of New and Renewable Energy (2026). *Grid Connected Rooftop Solar Programme.* Retrieved 15 June 2026 from https://mnre.gov.in/en/grid-connected-solar-rooftop-programme/
3. Press Information Bureau (2024). Retrieved 15 June 2026 from https://pib.gov.in/
4. Ministry of New and Renewable Energy (2024). *End-of-FY 2023–24 renewable energy installation figures.* Retrieved 15 June 2026 from https://mnre.gov.in/
5. Press Information Bureau (2024). *India Ranks Third Globally in Renewable Energy Installed Capacity: Shri Pralhad Joshi.* Retrieved June 15, 2026 from https://pib.gov.in/
6. Mercom India Research (2026). *India Rooftop Solar Market Report Q1 2026.* Retrieved 15 June 2026 from https://www.mercomindia.com/
7. Ministry of New and Renewable Energy (2025). *Ministry of New and Renewable Energy Organises 'Run for Sun' Marathon on International Sun Day.* Retrieved 15 June 2026 from https://mnre.gov.in/
8. CNBC TV18. (2024, July 23). India installing 1 lakh solar panels per week under PM Surya Ghar: Pralhad Joshi. Retrieved 3 July 2026, from https://www.cnbctv18.com/energy/india-installing-1-lakh-solar-panels-per-week-under-pm-surya-ghar-pralhad-joshi-ws-l-19923163.htm
9. Mercom India Research (2026). *India Rooftop Solar Market Report Q1 2026.* Retrieved 15 June 2026 from https://www.mercomindia.com/
10. ETEnergyworld (n.d.). India achieves 2.7 GW rooftop solar capacity growth in Q1 2026, driven by residential demand. Retrieved 14 July 2026 from https://energy.economictimes.indiatimes.com/news/renewable/india-achieves-27-gw-rooftop-solar-capacity-growth-in-q1-2026-driven-by-residential-demand/131367659
11. Ministry of New and Renewable Energy (2019). *State of Renewable Energy in India 2019.* Retrieved 15 June 2026 from https://mnre.gov.in/
12. Ministry of New and Renewable Energy (2024). *Guidelines for PM-Surya Ghar: Muft Bijli Yojana – Central Financial Assistance to Residential Consumers.* Retrieved 15 June 2026 from https://mnre.gov.in/
13. Ministry of New and Renewable Energy (n.d.). CFA to Residential Consumer. PM Surya Ghar: Muft Bijli Yojana National Portal, Scheme Guidelines. Retrieved 15 June 2026 from https://consumer.pmsuryaghar.gov.in/consumer/#/knowledge-center/scheme-guidelines

14. Ministry of New and Renewable Energy (n.d.). *PM Surya Ghar: Muft Bijli Yojana National Portal.* Retrieved 15 June 2026 from https://pmsuryaghar.gov.in/
15. Government of Jharkhand, Department of Energy (5 July 2022). Jharkhand State Solar Policy, 2022. Jharkhand Renewable Energy Development Agency (JREDA). Retrieved 3 Aug. 2026, from https://api.jreda.com/all-uploaded-img/img/6360e972de5e0.pdf
16. Chhattisgarh State Power Distribution Company Limited (14 July 2026). Design, supply, erection, testing, and commissioning including warranty, comprehensive operation & maintenance of grid-connected rooftop solar plants of various capacities in the residential sector under the 'Utility-Led Aggregation (ULA) Models' of PM-Surya Ghar: Muft Bijli Yojana of MNRE under EPC (CAPEX) in the State of Chhattisgarh (RfS No. CSPDCL/NIT/ULA-114.23 MW-/1095). Retrieved 3 July 2026, from https://web.cspdcl.co.in/#/ViewPublishedTender
17. Ministry of New and Renewable Energy (n.d.). RTS regulations of States. PM Surya Ghar: Muft Bijli Yojana National Portal, Scheme Guidelines. Retrieved 15 June 2026 from https://consumer.pmsuryaghar.gov.in/consumer/#/knowledge-center/scheme-guidelines
18. TP Central Odisha Distribution Limited (n.d.). *Empanelled Vendors under TPCODL.* Retrieved 15 June 2026 from https://www.tpcentralodisha.com/
19. Ministry of New and Renewable Energy (2024). *Guidelines for PM-Surya Ghar: Muft Bijli Yojana.* Retrieved 15 June 2026 from https://mnre.gov.in/
20. Odisha Electricity Regulatory Commission. (2026, March 31). DISCOM Tariff Order FY 2026–27. Retrieved 3 Aug. 2026, from https://www.orierc.org/CuteSoft_Client/writereaddata/upload/DISCOM_TARIFF_ORDER_FY_2026-27.pdf
21. Oraon, S. (2026, March 25). Jharkhand Electricity Rate: झारखंडियों को लगा 'महंगाई का करंट': बिजली टैरिफ में भारी बढ़ोतरी, देखें नया रेट कार्ड. Prabhat Khabar. Retrieved 3 July, 2026, from https://www.prabhatkhabar.com/state/jharkhand/ranchi/jharkhand-electricity-rate-hiked-2026-jbvnl-new-power-charge-list
22. Jharkhand State Electricity Regulatory Commission. (2026, March 25). True-up for FY 2024–25, Annual Performance Review for FY 2025–26, Approval of Business Plan & MYT ARR for the Control Period from FY 2026–27 to FY 2030–31 and Tariff Determination for FY 2026–27 (JBVNL Tariff Order). Retrieved 3 Aug. 2026, from https://jbvnl.co.in/front/pdf/tariff/Tariff%20JBVNL-2026.pdf
23. Ministry of New and Renewable Energy (4 June 2026). 75 lakh households targeted for rooftop solar installations by December 2026: Union New & Renewable Minister, Shri Pralhad Joshi. Press Information Bureau. Retrieved 3 July 2026 from https://www.pib.gov.in/PressReleasePage.aspx?PRID=2244670&lang=1&reg=3
24. Ministry of New and Renewable Energy (4 June 2026). 75 lakh households targeted for rooftop solar installations by December 2026: Union New & Renewable Minister, Shri Pralhad Joshi. Press Information Bureau. Retrieved 15 June 2026 from https://www.pib.gov.in/PressReleasePage.aspx?PRID=2268992&lang=1&reg=48

25. Information and Public Relations Department, Government of Haryana (22 May 2026). High-level review meeting held on progress of PM Surya Ghar Muft Bijli Yojana; directions issued to speed up installation of all rooftop solar systems; 81,735 connections released under PMSGMBY. Press Release Management System, Government of Haryana. Retrieved 15 June 2026 from https://prms.prharyana.gov.in/press-release/1935
26. Varadhan S, Gopakumar G, Dash J (15 Feb 2026). Modi's rooftop solar push slowed by reluctant lenders, states. Reuters. Retrieved 15 June 2026 from https://www.reuters.com/sustainability/climate-energy/modis-rooftop-solar-push-slowed-by-reluctant-lenders-states-2026-02-15/
27. Ministry of New and Renewable Energy (4 June 2026). 75 lakh households targeted for rooftop solar installations by December 2026: Union New & Renewable Minister, Shri Pralhad Joshi. Press Information Bureau. Retrieved 15 June 2026 from https://www.pib.gov.in/PressReleasePage.aspx?PRID=2268992&lang=1&reg=48
28. *Economic Times* (2026). India's solar boom has a new address: smaller Tier-II, Tier-III cities leaving behind the metros. Retrieved 15 June 2026 from https://economictimes.indiatimes.com/industry/renewables/indias-solar-boom-has-a-new-address-smaller-tier-ii-tier-iii-cities-leaving-behind-the-metros/articleshow/132362068.cms

Annexures

Annexure 1: Consumer complaints vendors to banks and DISCOMs



Email [redacted]
Mobile [redacted]

सम्पदाएम, आस्ति गुणवत्ता, इष्टमी उपयोगिता और कार्य दक्षता
Profitability, Asset Quality, Capital Optimization & Efficiency

"Go Green, Save Earth"

Save a tree. Don't print this e-mail unless it's really necessary.

From: [redacted]
Sent: 17 March 2026 18:08
To: [redacted]
Cc: Credit Ro Berhampur (Union Bank Of India) <credit.roberhampur@unionbankofindia.bank.in>
Subject: Complaint regarding Service Issue and Delay in Installation Process

आदरणीय महोदय / महोदय
Respected Madam / Sir

Refer to subject matter, I am writing this to fromally lodge a complaint regarding the unsatisfactory service and undue delay in the installation of the Solar system to the below customers;

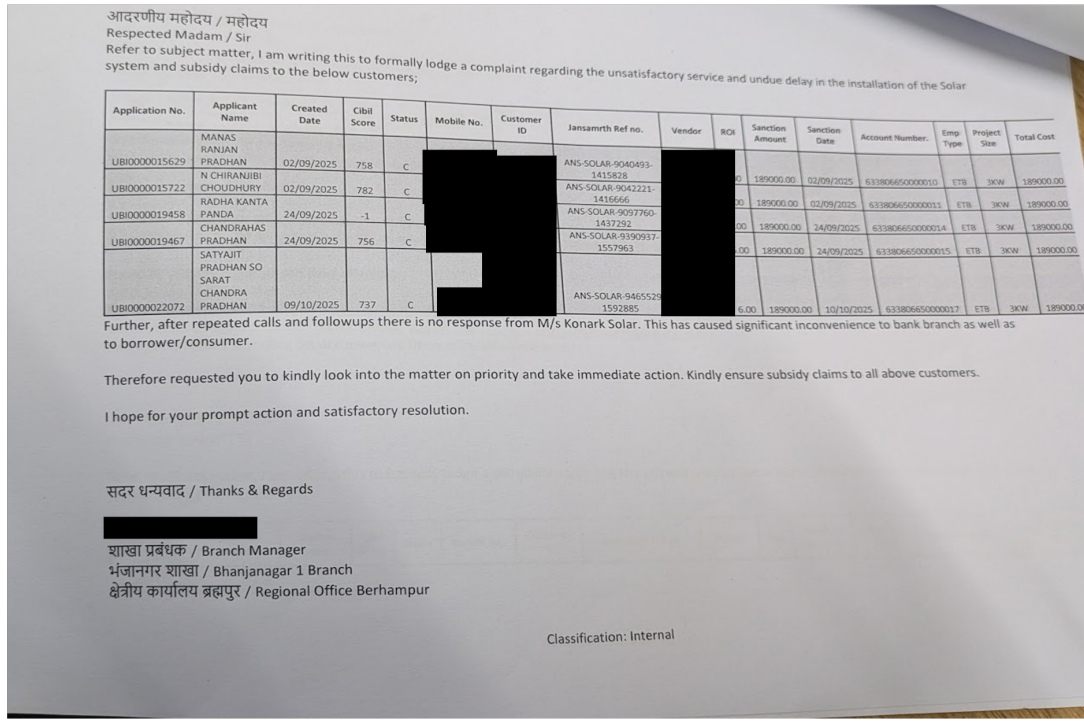
Application No.	Applicant Name	Created Date	Cibil Score	Status	Mobile No.
UBI0000015629	MANAS RANJAN PRADHAN	02/09/2025	758	C	[redacted]
UBI0000015722	N CHIRANJIBI CHOUDHURY	02/09/2025	782	C	[redacted]
UBI0000019458	RADHA KANTA PANDA	24/09/2025	-1	C	[redacted]
UBI0000019467	CHANDRAHAS PRADHAN	24/09/2025	756	C	[redacted]
UBI0000022072	SATYAJIT PRADHAN SO SARAT CHANDRA PRADHAN	09/10/2025	737	C	[redacted]

We have sanctioned and disbursed full payment for the solar installation as per quotations. As per your commitme the installation and claim of subsidy to be completed with in 3 months. However, despite repeated followups, the installation is still pending / not completed satisfactorily. This has caused significant inconvenience to branch as we to borrower/consumer.

Therefore requested you to kindly look into the matter on priority and ensure that;

- The installation is to be completed immediately.
- All service related issues are to be resolved promptly.
- Proper communication is to be maintained with consumer as well as bank.

hope for your promt action and satisfactory resolution.



आदरणीय महोदय / महोदय
Respected Madam / Sir
Refer to subject matter, I am writing this to formally lodge a complaint regarding the unsatisfactory service and undue delay in the installation of the Solar system and subsidy claims to the below customers;

Application No.	Applicant Name	Created Date	Cibil Score	Status	Mobile No.	Customer ID	Jansamrth Ref no.	Vendor	ROI	Sanction Amount	Sanction Date	Account Number.	Emp Type	Project Size	Total Cost
UBI0000015629	MANAS RANJAN PRADHAN	02/09/2025	758	C	[redacted]		ANS-SOLAR-9040493-1415828	[redacted]		189000.00	02/09/2025	633806650000010	ETB	3KW	189000.00
UBI0000015722	N CHIRANJIBI CHOUDHURY	02/09/2025	782	C			ANS-SOLAR-9042221-1416666			189000.00	02/09/2025	633806650000011	ETB	3KW	189000.00
UBI0000019458	RADHA KANTA PANDA	24/09/2025	-1	C			ANS-SOLAR-9097760-1437292			189000.00	24/09/2025	633806650000014	ETB	3KW	189000.00
UBI0000019467	CHANDRAHAS PRADHAN	24/09/2025	756	C			ANS-SOLAR-9390937-1557963			189000.00	24/09/2025	633806650000015	ETB	3KW	189000.00
UBI0000022072	SATYAJIT PRADHAN SO SARAT CHANDRA PRADHAN	09/10/2025	737	C			ANS-SOLAR-9465529-1592885			189000.00	10/10/2025	633806650000017	ETB	3KW	189000.00

Further, after repeated calls and followups there is no response from M/s Konark Solar. This has caused significant inconvenience to bank branch as well as to borrower/consumer.

Therefore requested you to kindly look into the matter on priority and take immediate action. Kindly ensure subsidy claims to all above customers.

I hope for your prompt action and satisfactory resolution.

सदर धन्यवाद / Thanks & Regards

[redacted]
शाखा प्रबंधक / Branch Manager
भंजानगर शाखा / Bhanjanagar 1 Branch
क्षेत्रीय कार्यालय ब्रह्मपुर / Regional Office Berhampur

Classification: Internal

Annexure 2: Old electricity bills compared to new electricity bills of a consumer in Sambalpur, Odisha



TP Western
Odisha Distibution
[redacted]
Electricity

BILL NO: 411040525000041M1482
DT : 04-05-2025 12:37
DIV: SED SAMBALPUR
SUB DIV: SDO-I SAMBALPUR (AINTHA PALI)
SEC: ESO HOSPITAL

SC. NO : 411722070413
A/C NO : 14111024159
CAT : LT-DOM
AV.SD : 5641.0
OLD AC. NO: COM-7B-45
MOB. NO : [redacted]
EMAIL :
NAME : SMT.T.R.MOHAPATRA
ADDR : FATAK,NEAR STATION SAMBALPUR
LOAD:2.0KW PH:1

MTR NO : WLT029457
OWNERSHIP: SELF
MTR RENT COUNT: 0/60
B MDI:2.0
MDI:2.0 MF:1.0
READING DATE STATUS (I)
CURR: 65800 04-05-25 U
PREV: 64653 06-04-25 U
BILL UNIT: 1147
BASIS: ACTUAL
BILL DAYS : 28.0
NO.OF MONTH: 1.0
LST RD DT/STS: 06-04-25/U

BILL SLABS
0.00 * 2.9 = 145.000
50.00 * 4.7 = 705.000
200.00 * 5.7 = 1140.000
747.00 * 6.1 = 4556.700

ENERGY CHG : 6546.7
FIXED CHGS : 40.0
METER RENT : 0.0
ELEC. DUTY : 261.87
CURR. AMT : 6848.57
DPS : 0.00
ARR/ ADV : 0.37
PROV ADJ :
-(0.00+0.00) = -(0.00)

Bill Rev Adj : 0.00
MISC AMT : 0.00000
TOTAL BILL : 6848.00
PROMT REBT : -(114.70)
RURAL REBT : -(0.00)
BEF. REBT DT :6734.00
DIG REBT : -(259.88)
ONLINE CURR.BL
BY DUE DT :6474.99
AFT. REBT DT :6848.00
REBT DT : 13-05-2025
DISC DT : 19-05-2025

TP WESTERN ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)

411722070413

BILL OF SUPPLY FOR ELECTRIC

Consumer Name	: TULASIRANI MAHAPATRA	**Rebate Date**
Address Details	: FATAK,NEAR STATION SAMBALPUR , PINCODE:0	**Due Date**
		Consumer A/c No.
		Consumer ID
		Old Consumer No.
		Bill Number
		Bill Issue Date
Email Id	: tulasiranimahapatra8@gmail.com	**Bill Basis**
Mobile No	: 8018920995	**Last Bill Issue Date**
		Bill Month

Area Details		Connection Details	
Division	: SED SAMBALPUR	Tariff Category	: DOMESTIC
Sub-Division	: SDO-I SAMBALPUR	Category Type	: LT
Section	: ESO HOSPITAL	Contract Demand	: 3.3 KW
DT No.	:	Supply Voltage	: 230 V
Pole No.	:	Own Transformer	: NO
MRU No.	:	ED Exemption	: NO
Walking Sequence	:	Date of Connection	: 01/01/1990
Organization Type	:	Security Deposit	: 2,033.83
Connection Type	:	Metering Side	: LT
Consumption Type	: SOLAR	Consumer Status	: Active
		Transformer Rating	: 0 KVA

Meter Reading Details

Parameter	Prev Reading	Current Reading	Diff	T.F Loss	Total
KWH	803.0000	1,717.0000	914.0000	0.000	1,036.0000
KVAH	0.0000	0.0000	0.0000	0.000	0.0000
MD-KW	0.0000	4.9800	0.0000	0.000	4.9800
SOLAR	1,237.3380	1,438.8920	201.5540	0.000	201.5540

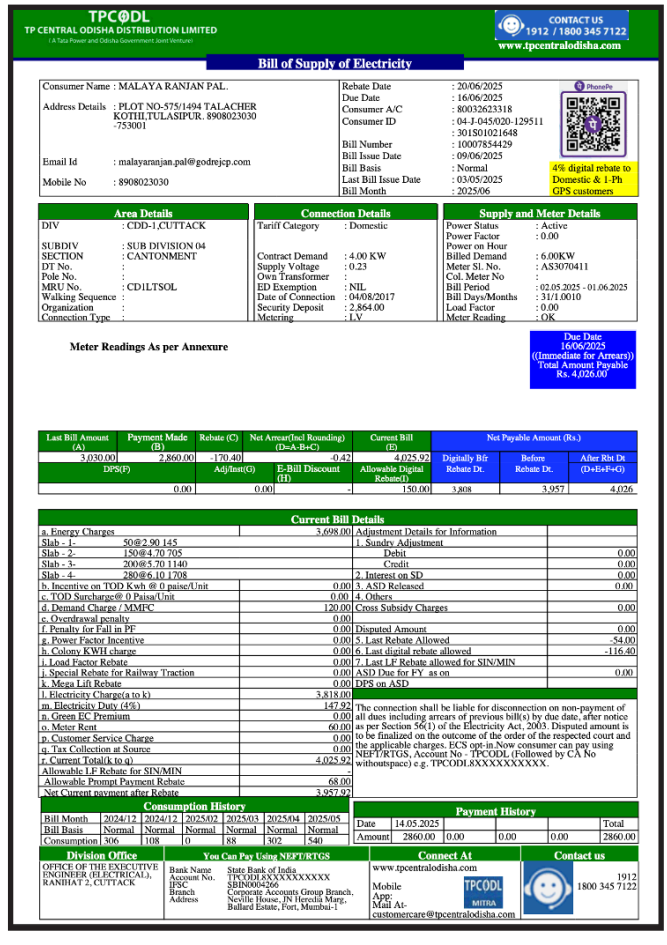
Disclaimer: Consumption inclusive of Solar, Open access, Colony and Multi meter, please see Annexure below.

Last Bill Amt(Rs.)	Pymt Rcvd(Rs.)	Rebate(Rs.)	Cr. Sundry Adj.(A)	Net Arrear(R
140.45	135.00	5.6	0.00	
Curr. Bill Amt(Rs.)	**DPS(Rs.)**	**Misc Charges**	**Prov Adj.(Rs.)**	**Installments(**
4,925.72	0.00	0.00	-0.00	

Current Bill Details

a. Energy Charges				4,640.12	1. Bill Rev Adj(B)
	Slab 1 - null	50@	2.90	145.00	Debit
	Slab 2 - null	150@	4.70	705.00	Credit
	Slab 3 - null	200@	5.70	1,140.00	2. Interest on SD(After
	Slab 4 - null	434.446@	6.10	2,650.12	
a.1 Green Tariff Premium(GTP)				0.00	3. Total Current Bill(Aft
b. Incentive on TOD / TOD Surchg				0.00 / 0.00	4. Rebate Allowable
c. Demand Charge / MMFC				100.00	Prompt Payment+Rur
d. Overdrawal penalty				0.00000	5. Net Current paymer
e. Penalty for Fall in PF 0%				0.00	Digital Payment Re
f. Power Factor Incentive				0.00	6.Net Current payment
g. Colony KvaH charge				0.00	7. Cross Subsidy Charg
h. LF Rebate/ Spl Discount / EBill Rebate				0.00 / 0.00/ 0.00	8. Disputed Amount
i. Electricity Charge				4,740.12	9. Last [redacted]owed

Annexure 3: Sample bill of Mr Malaya from Cuttack, Odisha



TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)

CONTACT US
1912 / 1800 345 7122
www.tpcentralodisha.com

Bill of Supply of Electricity

Consumer Name	: MALAYA RANJAN PAL.	Rebate Date	: 20/06/2025
Address Details	: PLOT NO-575/1494 TALACHER KOTIII,TULASIPUR. 8908023030 -753001	Due Date	: 16/06/2025
		Consumer A/C	: 80032623318
		Consumer ID	: 04-J-045/020-129511 : 301501021648
		Bill Number	: 10007854429
Email Id	: malayaranjan.pal@godrejcp.com	Bill Issue Date	: 09/06/2025
		Bill Basis	: Normal
Mobile No	: 8908023030	Last Bill Issue Date	: 03/05/2025
		Bill Month	: 2025/06

4% digital rebate to Domestic & 1-Ph GPS customers

Area Details		Connection Details		Supply and Meter Details	
DIV	: CDD-1,CUTTACK	Tariff Category	: Domestic	Power Status	: Active
				Power Factor	: 0.00
SUBDIV	: SUB DIVISION 04			Power on Hour	
SECTION	: CANTONMENT	Contract Demand	: 4.00 KW	Billed Demand	: 6.00KW
DT No.	:	Supply Voltage	: 0.23	Meter Sl. No.	: AS3070411
Pole No.	:	Own Transformer	:	Col. Meter No	:
MRU No.	: CD1LTSOL	ED Exemption	: NIL	Bill Period	: 02.05.2025 - 01.06.2025
Walking Sequence	:	Date of Connection	: 04/08/2017	Bill Days/Months	: 31/1.0010
Organization	:	Security Deposit	: 2,864.00	Load Factor	: 0.00
Connection Type	:	Metering	: LV	Meter Reading	: OK

Meter Readings As per Annexure

Due Date
16/06/2025
((Immediate for Arrears))
Total Amount Payable
Rs. 4,026.00

Last Bill Amount (A)	Payment Made (B)	Rebate (C)	Net Arrear(Incl Rounding) (D=A-B+C)	Current Bill (E)	Net Payable Amount (Rs.)		
3,030.00	2,860.00	-170.40	-0.42	4,025.92	Digitally Bfr Rebate Dt.	Before Rebate Dt.	After Rbt Dt (D+E+F+G)
DPS(F)		Adj/Instt(G)	E-Bill Discount (H)	Allowable Digital Rebate(I)			
0.00		0.00	-	150.00	3,808	3,957	4,026

Current Bill Details

a. Energy Charges	3,698.00	Adjustment Details for Information	
Slab - 1- 50@2.90 145		1. Sundry Adjustment	
Slab - 2- 150@4.70 705		Debit	0.00
Slab - 3- 200@5.70 1140		Credit	0.00
Slab - 4- 280@6.10 1708		2. Interest on SD	0.00
b. Incentive on TOD Kwh @ 0 paise/Unit	0.00	3. ASD Released	0.00
c. TOD Surcharge@ 0 Paisa/Unit	0.00	4. Others	
d. Demand Charge / MMFC	120.00	Cross Subsidy Charges	0.00
e. Overdrawal penalty	0.00		
f. Penalty for Fall in PF	0.00	Disputed Amount	0.00
g. Power Factor Incentive	0.00	5. Last Rebate Allowed	-54.00
h. Colony KWH charge	0.00	6. Last digital rebate allowed	-116.40
i. Load Factor Rebate	0.00	7. Last LF Rebate allowed for SIN/MIN	
j. Special Rebate for Railway Traction	0.00	ASD Due for FY as on	0.00
k. Mega Lift Rebate	0.00	DPS on ASD	
l. Electricity Charge(a to k)	3,818.00		
m. Electricity Duty (4%)	147.92	The connection shall be liable for disconnection on non-payment of all dues including arrears of previous bill(s) by due date, after notice as per Section 56(1) of the Electricity Act, 2003. Disputed amount is to be finalized on the outcome of the order of the respected court and the applicable charges. ECS opt-in.Now consumer can pay using NEFT/RTGS, Account No - TPCODL (Followed by CA No withoutspace) e.g. TPCODL8XXXXXXXXXX.	
n. Green EC Premium	0.00		
o. Meter Rent	60.00		
p. Customer Service Charge	0.00		
q. Tax Collection at Source	0.00		
r. Current Total(k to q)	4,025.92		
Allowable LF Rebate for SIN/MIN	-		
Allowable Prompt Payment Rebate	68.00		
Net Current payment after Rebate	3,957.92		

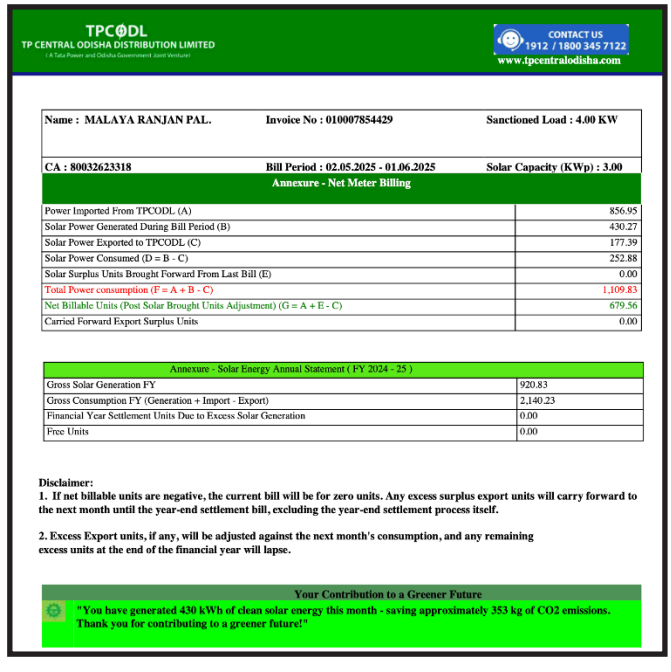
Consumption History

Bill Month	2024/12	2024/12	2025/02	2025/03	2025/04	2025/05
Bill Basis	Normal	Normal	Normal	Normal	Normal	Normal
Consumption	306	108	0	88	302	540

Payment History

Date	14.05.2025				Total
Amount	2860.00	0.00	0.00	0.00	2860.00

Division Office	You Can Pay Using NEFT/RTGS	Connect At	Contact us
OFFICE OF THE EXECUTIVE ENGINEER (ELECTRICAL), RANIHAT 2, CUTTACK	Bank Name: State Bank of India Account No.: TPCODL8XXXXXXXXXX IFSC: SBIN0004266 Branch Address: Corporate Accounts Group Branch, Neville House, JN Heredia Marg, Ballard Estate, Fort, Mumbai-1	www.tpcentralodisha.com Mobile App: TPCODL MITRA Mail At- customercare@tpcentralodisha.com	1912 1800 345 7122



TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)

CONTACT US
1912 / 1800 345 7122
www.tpcentralodisha.com

Name : MALAYA RANJAN PAL. **Invoice No : 010007854429** **Sanctioned Load : 4.00 KW**

CA : 80032623318 **Bill Period : 02.05.2025 - 01.06.2025** **Solar Capacity (KWp) : 3.00**

Annexure - Net Meter Billing

Power Imported From TPCODL (A)	856.95
Solar Power Generated During Bill Period (B)	430.27
Solar Power Exported to TPCODL (C)	177.39
Solar Power Consumed (D = B - C)	252.88
Solar Surplus Units Brought Forward From Last Bill (E)	0.00
Total Power consumption (F = A + B - C)	1,109.83
Net Billable Units (Post Solar Brought Units Adjustment) (G = A + E - C)	679.56
Carried Forward Export Surplus Units	0.00

Annexure - Solar Energy Annual Statement (FY 2024 - 25)	
Gross Solar Generation FY	920.83
Gross Consumption FY (Generation + Import - Export)	2,140.23
Financial Year Settlement Units Duc to Excess Solar Generation	0.00
Free Units	0.00

Disclaimer:

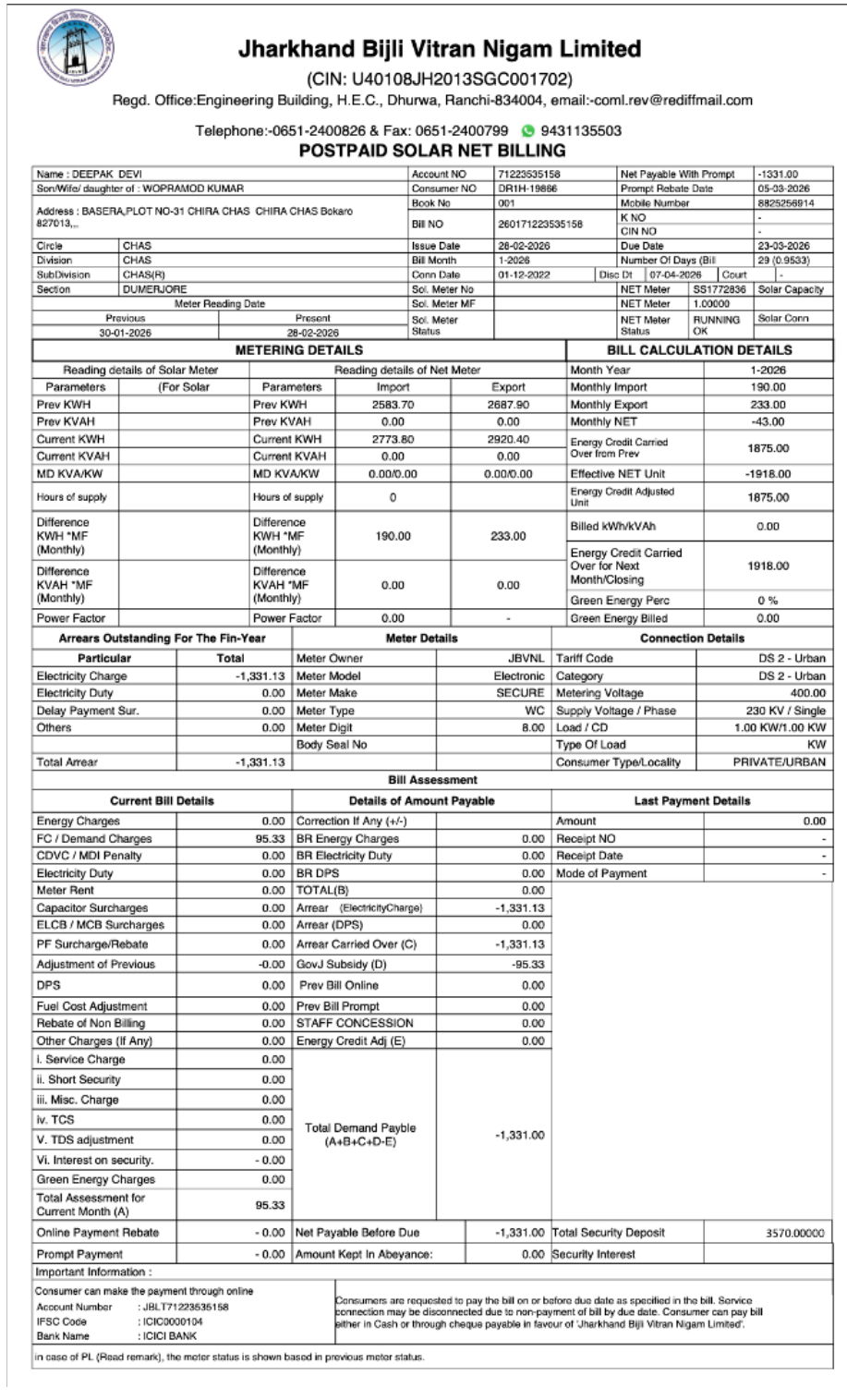
1. If net billable units are negative, the current bill will be for zero units. Any excess surplus export units will carry forward to the next month until the year-end settlement bill, excluding the year-end settlement process itself.

2. Excess Export units, if any, will be adjusted against the next month's consumption, and any remaining excess units at the end of the financial year will lapse.

Your Contribution to a Greener Future

"You have generated 430 kWh of clean solar energy this month - saving approximately 353 kg of CO2 emissions. Thank you for contributing to a greener future!"

Annexure 4: Sample Bill of Ms Deepak Devi, first PM Surya Ghar consumer from the state of Jharkhand



Jharkhand Bijli Vitran Nigam Limited

(CIN: U40108JH2013SGC001702)

Regd. Office:Engineering Building, H.E.C., Dhurwa, Ranchi-834004, email:-coml.rev@rediffmail.com

Telephone:-0651-2400826 & Fax: 0651-2400799 9431135503

POSTPAID SOLAR NET BILLING

Name : DEEPAK DEVI			Account NO	71223535158	Net Payable With Prompt		-1331.00
Son/Wife/ daughter of : WOPRAMOD KUMAR			Consumer NO	DR1H-19886	Prompt Rebate Date		05-03-2026
Address : BASERA,PLOT NO-31 CHIRA CHAS CHIRA CHAS Bokaro 827013,,,			Book No	001	Mobile Number		8825256914
			Bill NO	260171223535158	K NO		-
					CIN NO		-
Circle	CHAS		Issue Date	28-02-2026	Due Date		23-03-2026
Division	CHAS		Bill Month	1-2026	Number Of Days (Bil		29 (0.9533)
SubDivision	CHAS(R)		Conn Date	01-12-2022	Disc Dt	07-04-2026	Court -
Section	DUMERJORE		Sol. Meter No		NET Meter	SS1772836	Solar Capacity
Meter Reading Date			Sol. Meter MF		NET Meter	1.00000	
Previous	Present		Sol. Meter Status		NET Meter Status	RUNNING OK	Solar Conn
30-01-2026	28-02-2026						

METERING DETAILS

Reading details of Solar Meter		Reading details of Net Meter		
Parameters	(For Solar	Parameters	Import	Export
Prev KWH		Prev KWH	2583.70	2687.90
Prev KVAH		Prev KVAH	0.00	0.00
Current KWH		Current KWH	2773.80	2920.40
Current KVAH		Current KVAH	0.00	0.00
MD KVA/KW		MD KVA/KW	0.00/0.00	0.00/0.00
Hours of supply		Hours of supply	0	
Difference KWH *MF (Monthly)		Difference KWH *MF (Monthly)	190.00	233.00
Difference KVAH *MF (Monthly)		Difference KVAH *MF (Monthly)	0.00	0.00
Power Factor		Power Factor	0.00	-

BILL CALCULATION DETAILS

Month Year	1-2026
Monthly Import	190.00
Monthly Export	233.00
Monthly NET	-43.00
Energy Credit Carried Over from Prev	1875.00
Effective NET Unit	-1918.00
Energy Credit Adjusted Unit	1875.00
Billed kWh/kVAh	0.00
Energy Credit Carried Over for Next Month/Closing	1918.00
Green Energy Perc	0 %
Green Energy Billed	0.00

Arrears Outstanding For The Fin-Year		Meter Details		Connection Details	
Particular	Total	Meter Owner	JBVNL	Tariff Code	DS 2 - Urban
Electricity Charge	-1,331.13	Meter Model	Electronic	Category	DS 2 - Urban
Electricity Duty	0.00	Meter Make	SECURE	Metering Voltage	400.00
Delay Payment Sur.	0.00	Meter Type	WC	Supply Voltage / Phase	230 KV / Single
Others	0.00	Meter Digit	8.00	Load / CD	1.00 KW/1.00 KW
		Body Seal No		Type Of Load	KW
Total Arrear	-1,331.13			Consumer Type/Locality	PRIVATE/URBAN

Bill Assessment

Current Bill Details		Details of Amount Payable		Last Payment Details	
Energy Charges	0.00	Correction If Any (+/-)	0.00	Amount	0.00
FC / Demand Charges	95.33	BR Energy Charges	0.00	Receipt NO	-
CDVC / MDI Penalty	0.00	BR Electricity Duty	0.00	Receipt Date	-
Electricity Duty	0.00	BR DPS	0.00	Mode of Payment	-
Meter Rent	0.00	TOTAL(B)	0.00		
Capacitor Surcharges	0.00	Arrear (ElectricityCharge)	-1,331.13		
ELCB / MCB Surcharges	0.00	Arrear (DPS)	0.00		
PF Surcharge/Rebate	0.00	Arrear Carried Over (C)	-1,331.13		
Adjustment of Previous	-0.00	GovJ Subsidy (D)	-95.33		
DPS	0.00	Prev Bill Online	0.00		
Fuel Cost Adjustment	0.00	Prev Bill Prompt	0.00		
Rebate of Non Billing	0.00	STAFF CONCESSION	0.00		
Other Charges (If Any)	0.00	Energy Credit Adj (E)	0.00		
i. Service Charge	0.00	Total Demand Payble (A+B+C+D-E)	-1,331.00		
ii. Short Security	0.00				
iii. Misc. Charge	0.00				
iv. TCS	0.00				
V. TDS adjustment	0.00				
Vi. Interest on security.	- 0.00				
Green Energy Charges	0.00				
Total Assessment for Current Month (A)	95.33				
Online Payment Rebate	- 0.00	Net Payable Before Due	-1,331.00	Total Security Deposit	3570.00000
Prompt Payment	- 0.00	Amount Kept In Abeyance:	0.00	Security Interest	

Important Information :

Consumer can make the payment through online
Account Number : JBLT71223535158
IFSC Code : ICIC0000104
Bank Name : ICICI BANK

Consumers are requested to pay the bill on or before due date as specified in the bill. Service connection may be disconnected due to non-payment of bill by due date. Consumer can pay bill either in Cash or through cheque payable in favour of 'Jharkhand Bijli Vitran Nigam Limited'.

In case of PL (Read remark), the meter status is shown based in previous meter status.

Annexure 5: Sample bill of Ms Shahnaz Bano, wife of Dr Shahid of Bilaspur region of Chhattisgarh

CHHATTISGARH STATE POWER DISTRIBUTION COMPANY LIMITED
छत्तीसगढ़ राज्य विद्युत वितरण कंपनी लिमिटेड

BP NO / SERVICE NO	1010225956	Last Payment of Rs	670.00	On Date	2026-05-28
		CHQ DUE DT	2026-05-25	CASH DUE DT	2026-05-28
BILL MONTH	2026/04	BILL NO	070800700678	BILL DT	2026-05-20
		METER NO		POLE NO	
NAME	SMT.SHAHNAZ BANO .				
ADDRESS	INFRANT OF SAI BABA HOSPITAL	ZONE/DC CODE	334281		
PANNA NAGAR RING ROAD-2		PHONE NO	07752-427038		
		PURPOSE	Residential Connection		
MOBILE NO	9303777786	TARIFF	LV1SD1SR25		
EMAIL ID		SANC LOAD	6.00 KW	BILL TYPE	OK Meter-LT

Meter Reading Details (kWh)			
Reading	Consumer Net Meter		DRE Gen Meter
	Import (A)	Export (B)	Gen (S)
IR	527	1217	0
FR	1309	1778	0
Diff	782	561	0
MF	1.0000	1.0000	
Assessment	0	0	0
Total	782	561	0
PF	0.00		
MD	7.0000		
SD HELD	15000		

Energy Accounting Details (kWh)			
1	Import unit during the month	(A)	782
2	Export unit during the month	(B)	561
3	Export unit carry forward from previous month	(C)	0
4	Net unit during the month	(D)=A-(B+C)	221
5	If (D) is positive unit, to be billed to the consumer	(E)	221
6	If (D) is negative,carry forward for next month	(F)	0
7	DRE Gen generated during the month	(S)	0
8	DRE Gen used for RPO this month	(S)	0

Consumer Billing Details	
MIN CHG	
FC	130.00
EC	4780.60
TOTAL EC+FC/MIN CHG	4910.60
DUTY	534.00
CESS	78.20
METER RENT	0.00
LTCS/WTCS	0.00
VCA / FPPAS	73.38
ASD	0.00
SOLAR REBATE	4390.07-
M-URJA REBATE	0.00
ADJUSTEMENT	0.00
TOTAL BILL	1206.11
SD ARREAR	
ARREAR	533.50-
BILL W/O SURCHARGE	670.00
CHQ DUE DT	2026-05-25

Reading History (Past 6 Month)				
S.N.	MONTH	READING	UNITS	METER STATUS
1	2026/03	527	381	OK
2	2026/02	146	115	OK
3	2026/01	31	272	OK
4	2025/12	17216	250	OK
5	2025/12	16966	99	MTR CHANGE
6	2025/10	129574	31	OK

Cumulative M-Urja Rebate upto this bill month			0.00
Cumulative Solar Rebate upto this bill month			4390.07-
Contact Number for Bill Complain			
AE/JE NAME	B.B. NETAM (EE)		
	GIRISH SHRIVASTAV (AE)		
PHONE NO	07752-427091 / 07752-427038		
EE NAME			
PHONE NO			
OTHER			
BILL WITH SURCHARGE		680.00	
CASH DUE DT		2026-05-28	

CHHATTISGARH STATE POWER DISTRIBUTION COMPANY LIMITED					
SERVICE NO	1010225956	CHQ DUE DT	2026-05-25	CASH DUE DT	2026-05-28
BILL MONTH	2026/04	BILL NO	070800700678	BILL DT	2026-05-20
ADDL. SD	0.00	PRE ARREARS	0.00		
BILL W/O SURCHARGE	670.00	BILL WITH SURCHARGE	680.00		
				PAYMENT RECEIPT SEAL	

India's PM Surya Ghar: Muft Bijli Yojana has expanded residential rooftop solar nationally. Yet progress remains uneven; consumer interest does not always translate into commissioned systems.

This report investigates this challenge across Odisha, Jharkhand and Chhattisgarh. Based on field research and interviews with DISCOMs, vendors, bank officials and consumers, it maps barriers from application to adoption. Odisha illustrates the value of dedicated utility teams, vendor engagement and consumer facilitation. Chhattisgarh shows how district-level oversight and faster commissioning can improve delivery. Jharkhand reveals how delayed bi-directional meter installation, billing-system gaps and weak coordination can stall deployment despite favourable rooftop solar economics.

The report also examines vendor quality, access to finance, consumer awareness and underserved households, including apartment residents, informal-sector workers and remote communities. It proposes practical measures—measurable service standards, transparent tracking, reliable grievance redress, consistent bank procedures, stronger after-sales support and expanded utility-led aggregation and shared-metering models. The findings point to a clear priority for India's rooftop solar transition: strengthen implementation so policy promises become dependable benefits for households.

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phone: 91-11-40616000 Fax: 91-11-29955879
E-mail: cse@cseindia.org Website: www.cseindia.org