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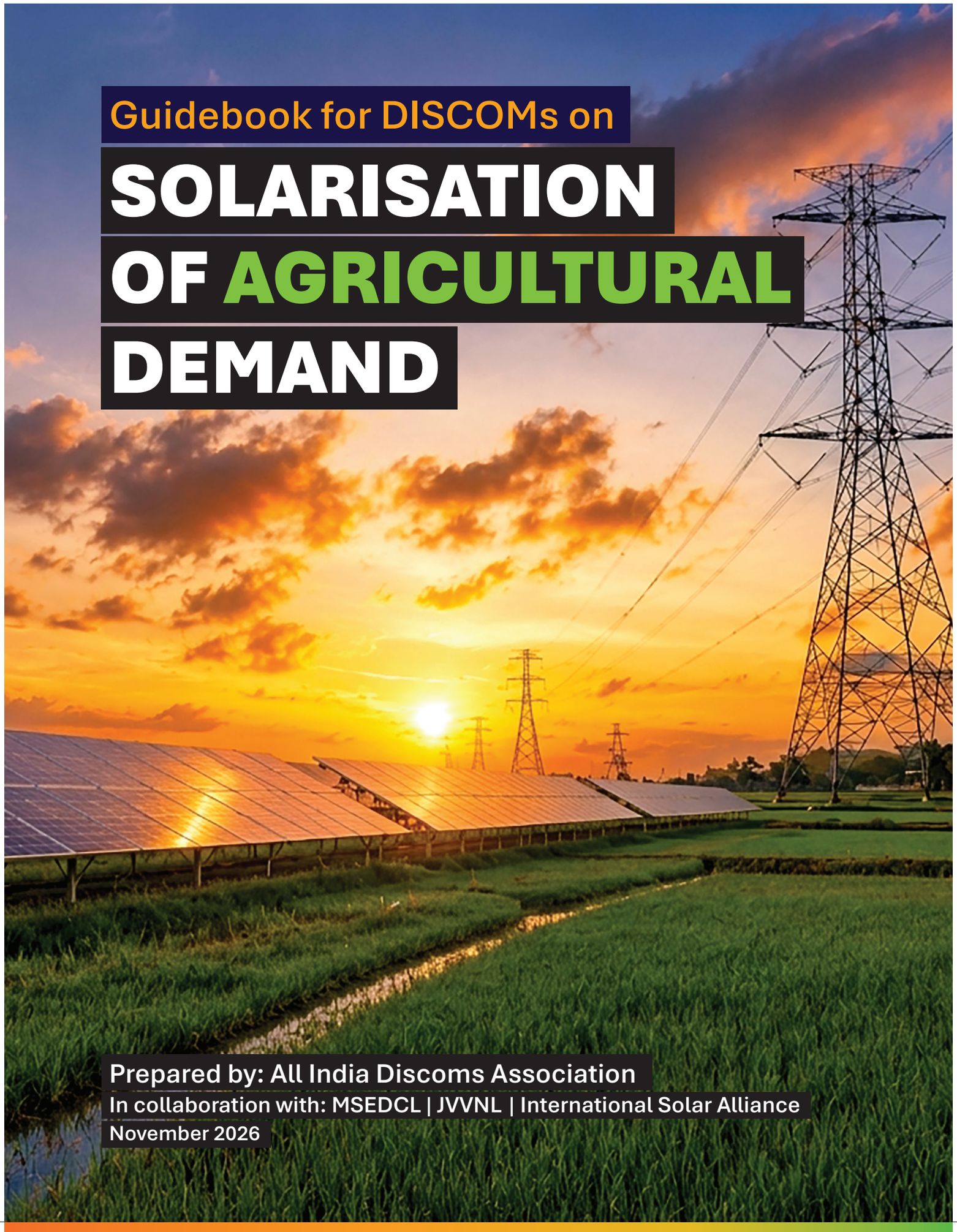

Guidebook for DISCOMs on

SOLARISATION OF AGRICULTURAL DEMAND

Prepared by: All India Discoms Association

In collaboration with: MSEDCL | JVVNL | International Solar Alliance

November 2026

Acknowledgements

The **Guidebook for Discoms on Solarization of Agricultural Demand** is a joint publication of the **All India Discoms Association (AIDA)** and the **International Solar Alliance (ISA).** It brings together practical experience and lessons from the implementation of agricultural solarisation programmes in India, with particular emphasis on the experience of distribution utilities and the evolution of programme approaches under PM-KUSUM.

The substantive work underpinning the Guidebook, including the documentation and analysis of the Indian experience, was undertaken by AIDA and its team, with valuable inputs and support from the Government of Maharashtra, **Maharashtra State Electricity Distribution Company Limited (MSEDCL), Jaipur Vidyut Vitran Nigam Limited (JVVNL),** and other stakeholders involved in the implementation of agricultural solarisation programmes.

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Mr. Sudhir Kumar, Research Officer, All India Discoms Association, served as the main coordinator from AIDA, facilitating collaboration among MSEDCL, JVVNL, and ISA throughout the development of the Guidebook. The coordination involved organising stakeholder meetings, facilitating knowledge exchange, consolidating inputs, and documenting implementation experiences and practical insights from agricultural solarisation programmes in India.

Their contributions have enabled the Guidebook to capture not only programme design and policy architecture, but also the operational experience, implementation challenges and institutional innovations that have emerged as agricultural solarisation has moved from pilots towards scale in India.

The International Solar Alliance has worked with AIDA to bring these experiences into a wider Global South perspective. The collaboration seeks to distinguish between programme features that are specific to the Indian institutional and regulatory context and the underlying implementation lessons that can be adapted by ISA Member Countries to their own agriculture, water, electricity, financing and institutional conditions. The chapter on global application has been developed with this objective.

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It is hoped that this Guidebook will serve as a practical South-South knowledge resource—carrying the lessons of India's experience to countries seeking to move from individual solar-pump deployment towards scalable, sustainable and locally adapted programmes for the solarisation of agriculture.

This publication has been developed with the All India Discoms Association (AIDA) using the latest available data and statistics from public and private sources. Reasonable efforts have been made to ensure that the information presented is factually correct, accurate, complete, and reliable. However, the International Solar Alliance (ISA) or AIDA shall not be responsible or liable for any loss or damage that may occur directly or indirectly from the use of or reliance on the contents of this publication.

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Foreword

I am happy to write foreword for this publication being brought out by All India Discoms Association (AIDA) in collaboration with International Solar Alliance (ISA) on the subject matter of learnings and best practices for scaling up solarization of electricity demand from irrigation segment.

Recognizing the immense potential of solar energy for meeting the electricity demand for irrigation, India started a very ambitious national programme Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyaan (PM KUSUM) in the year 2019. This programme was built upon two earlier initiatives: the first was for segregating the supply feeders for agricultural pump sets from the supply to consumers of other categories in rural areas, and the other one for solarising the off-grid diesel pump sets.

These initiatives have resulted into significant reduction in the cost of supply for agricultural consumers, system level benefits arising from shifting the agricultural demand from non-solar peak hours to solar hours in the day, and reduction in the burden of tariff subsidies being given by the State Governments to agricultural consumers.

The journey has not been easy. The progress in implementation of PM KUSUM in the initial years of the scheme was slow and patchy. But the persistence and addressing the challenges, both by the Central Government and the State Governments resulted in significant expansion in implementation of the programme in last few years.

This Guidebook documents the learnings from two major states of India (Maharashtra and Rajasthan) which I believe, could be extremely valuable to the other states in India for scaling the solarization of agricultural demand. The compendium covers various important aspects both from programme perspective as well as the utility perspective.

I am happy that the compendium is coming at the right time when the Government of India is planning to launch the second phase of PM KUSUM. We, in All India Discoms Association, are also privileged to collaborate with International Solar Alliance to present these learnings to the member countries of International Solar Alliance. I hope that these learnings will be highly relevant for them when they take up programmes for utilizing solar based electricity for meeting irrigation demand.

I gratefully acknowledge the support extended by Shri Lokesh Chandra, Chairman & Managing Director, Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) and Ms. Aarti Dogra, Chairperson, Discoms and MD, Jaipur Vidyut Vitran Nigam Ltd (JVVNL) in Rajasthan, without which it would not have been possible for AIDA to prepare this compendium.



(Alok Kumar)
Director General, All India Discoms Association

Foreword

Agriculture across much of the Global South continues to face a fundamental challenge: how to expand reliable and affordable irrigation while reducing dependence on costly and polluting sources of energy. Solar energy offers an important part of the answer. But experience has increasingly demonstrated that the transition from a successful solar pump installation to a sustainable national programme requires much more than technology alone.

India's experience in solarisation of agriculture is therefore of relevance. Through PM-KUSUM and complementary initiatives undertaken by States and distribution utilities, India has experimented with multiple approaches—stand-alone solar pumps, solarisation of grid-connected pumps, decentralised generation and feeder-level solarisation. More importantly, the journey has generated a substantial body of practical implementation experience on what enables programmes to move from pilots to scale.

This Guidebook captures that experience in considerable depth. The work undertaken by the **All India Discoms Association (AIDA),** drawing particularly upon the implementation experience of Maharashtra and Rajasthan, brings together the perspectives of policy makers, distribution utilities and programme implementers. It documents not only what has worked, but also the constraints encountered in areas such as land availability, grid readiness, procurement, financing, payment security, institutional coordination, digital monitoring and operations and maintenance. This makes the publication valuable not simply as a record of an Indian programme, but as an implementation resource.

The International Solar Alliance is pleased to partner with AIDA and states of Maharashtra and Rajasthan in bringing this knowledge to a wider audience. The substantive analytical work, case studies and implementation experience contained in this Guidebook have been developed by AIDA and its participating utilities. ISA's contribution has been to help extend this learning to the international context and to examine how the underlying principles can inform the design of programmes across its Member Countries. The concluding chapter, developed by ISA from this perspective, seeks to bridge India's experience with the diverse realities of countries across Africa, Asia, the Pacific, Latin America and the Caribbean.

Among these lessons, one stands out clearly: **scale follows risk reduction.** Successful programmes require countries to understand irrigation demand and water availability, choose the appropriate delivery model, prepare projects before procurement, establish credible financing and payment arrangements, build quality and service standards into contracts, create mechanisms for long-term operations and maintenance, and monitor performance through reliable data systems. Solarisation of agriculture must also remain firmly anchored in the water–energy–food nexus so that increased access to affordable energy supports productive and sustainable use of water rather than unintended over-extraction.

ISA's role is to support this transition by facilitating South-South knowledge exchange, helping countries undertake diagnostics and programme design, strengthening technical and institutional capacities, and bringing governments together with financing institutions, industry and other implementation partners. The partnership between

I congratulate AIDA, the participating distribution utilities, and all the officials and practitioners who have contributed their experience to this publication. I particularly appreciate AIDA's willingness to place these lessons in the public domain and to work with ISA in making them accessible to our Member Countries.

I hope this Guidebook will serve not only as a reference document, but as a starting point for practical collaboration—helping countries move **from pumps to programmes,** and from programmes to sustainable transformation of agricultural energy and irrigation systems across the Global South.



Ashish Khanna
Director General, International Solar Alliance



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List of Abbreviations

Abbreviation	Full form
ABT	Availability Based Tariff
ACoS	Average Cost of Supply
ACS	Additional Chief Secretary
ACS-ARR	Average Cost of Supply to Average Revenue Realised gap
ADB	Asian Development Bank
Ag	Agriculture
AI/ML	Artificial Intelligence/Machine Learning
AIDA	All India Discoms Association
AIIB	Asian Infrastructure Investment Bank
API	Application Programming Interface
ARR	Average Revenue Realised/Average Revenue Requirement
AT&C	Aggregate Technical and Commercial
AVVNL	Ajmer Vidyut Vitran Nigam Limited
BAU	Business as Usual
BCD	Basic Customs Duty
BESS	Battery Energy Storage System
BPL	Below Poverty Line
BU	Billion Units
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CEI / CEIG	Chief Electrical Inspector/Chief Electrical Inspector to Government
CFA	Central Financial Assistance
CMC	Comprehensive Maintenance Contract
CMD	Chairman and Managing Director
CMS	Contract Monitoring System
CO_2	Carbon Dioxide
CPSU	Central Public Sector Undertaking
CSR	Corporate Social Responsibility
CT / PT	Current Transformer/Potential Transformer
CUF	Capacity Utilisation Factor
DCR	Domestic Content Requirement
DISCOM	Distribution Company/Distribution Utility
DLC	District Level Committee
DSCR	Debt Service Coverage Ratio
DSM	Demand Side Management
EPC	Engineering, Procurement and Construction
EWS	Economically Weaker Sections
FAQ	Frequently Asked Questions
FLS	Feeder Level Solarisation
FPO	Farmer Producer Organisation
FY	Financial Year
GDP	Gross Domestic Product

Abbreviation	Full form
GEAPP	Global Energy Alliance for People and Planet
GIS	Geographic Information System
GoI	Government of India
GoM	Government of Maharashtra
GoR	Government of Rajasthan
GP	Gram Panchayat
GPS	Global Positioning System
GR	Government Resolution
GSDP	Gross State Domestic Product
GST	Goods and Services Tax
GSVA	Gross State Value Added
GVA	Gross Value Added
GW	Gigawatt
GWh	Gigawatt-hour
ha	Hectare
HP	Horsepower
HSN	Harmonised System of Nomenclature
HV	High Voltage
IEC	Information, Education and Communication
IISD	International Institute for Sustainable Development
IPO	Initial Public Offering
IPS	Individual Pump Solarisation
ISGF	India Smart Grid Forum
IT	Information Technology
JdVVNL	Jodhpur Vidyut Vitran Nigam Limited
JVVNL	Jaipur Vidyut Vitran Nigam Limited
km	Kilometre
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hour
LC	Letter of Credit
LIS	Lift Irrigation Scheme
LoA	Letter of Award
LoI	Letter of Intent
LPS	Late Payment Surcharge
LT	Low Tension
LV	Low Voltage
Maha-SKY	Maharashtra Saurya Kaushal Yojana
MEDA	Maharashtra Energy Development Agency
MERC	Maharashtra Electricity Regulatory Commission
MIS	Management Information System
MNRE	Ministry of New and Renewable Energy
MRSAC	Maharashtra Remote Sensing Application Centre
MSAPL	MSEB Solar Agro Power Limited

Abbreviation	Full form
MSDE	Ministry of Skill Development and Entrepreneurship
MSEB	Maharashtra State Electricity Board
MSEDCL	Maharashtra State Electricity Distribution Company Limited
MSETCL	Maharashtra State Electricity Transmission Company Limited
MSKPY	Mukhyamantri Saur Krushi Pump Yojana
MSKVY	Mukhyamantri Saur Krushi Vahini Yojana
MSPGCL	Maharashtra State Power Generation Company Limited
MTSKPY	Magel Tyala Saur Krushi Pump Yojana
$MtCO_2e$	Million tonnes of carbon dioxide equivalent
MU	Million Units
MW	Megawatt
MWh	Megawatt-hour
NA	Non-Agricultural
NDC	Nationally Determined Contribution
NOC / NoC	No Objection Certificate
NSDC	National Skill Development Corporation
NSQF	National Skills Qualifications Framework
O&M	Operations and Maintenance
OFS	Offer for Sale
OM	Office Memorandum
OTP	One-Time Password
PBG	Performance Bank Guarantee
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
PMU	Project Monitoring Unit
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSP	Pumped Storage Project
PV	Photovoltaic
RBL	Results-Based Lending
RBP	Results-Based Programme
RDSS	Revamped Distribution Sector Scheme
RE	Renewable Energy
RERC	Rajasthan Electricity Regulatory Commission
RESCO	Renewable Energy Service Company
RMS	Remote Monitoring System
RoW	Right of Way
RPO / RCO	Renewable Purchase Obligation / Renewable Consumption Obligation
RTS	Rooftop Solar
RUVITL	Rajasthan Urja Vikas and IT Services Limited
RVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Limited
SBD	Standard Bidding Document
SC/ST	Scheduled Caste / Scheduled Tribe
SCADA	Supervisory Control and Data Acquisition
SCGJ	Skill Council for Green Jobs

Abbreviation	Full form
SDG	Sustainable Development Goal
SDO	Sub-Divisional Officer
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commission
SLD	Single Line Diagram
SMART	Swayampurn Maharashtra Awasiya Rooftop Scheme
SNA	State Nodal Agency
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle / Solar Photovoltaic (as context requires)
SSPA	Share Sale and Purchase Agreement
SWP	Single Window Portal
T&D	Transmission and Distribution
TBCB	Tariff Based Competitive Bidding
tCO_2/MWh	Tonnes of carbon dioxide per megawatt-hour
TOSE	Tax on Sale of Electricity
TSP	Tribal Sub-Plan
UoM	Unit of Measure
USD	United States Dollar
VGF	Viability Gap Funding
WUA	Water User Association

Executive Summary

Strategic context and policy imperative

Agriculture remains central to India's livelihoods and to power sector planning. It contributed about 17.94% of India's gross value added (GVA) in FY25 and supports around 46% of the workforce. Reliable electricity for irrigation therefore bears directly on farm productivity, on food security and on the stability of rural incomes.

That dependence rests, in turn, on groundwater and on electricity. Net irrigated area stood at around 79 million hectares in FY23, and groundwater served about 62% of it. Some 32 million irrigation pumps run across diesel, electricity and solar. Agricultural electricity is therefore among the most significant rural service obligations a distribution company (DISCOM) carries.

The existing supply model creates a structural problem for utilities. Agricultural power is socially essential, yet it is commonly delivered through subsidised tariffs, dispersed feeders, night-time schedules and long rural networks. The result is a gap between the cost of supply and the revenue realised, widened further by delayed subsidy release,



technical losses and cross-subsidy erosion. Together these weaken DISCOM liquidity and leave thin capacity to invest in the rural network.

Solar generation answers this problem directly, because output arrives during daylight hours and can be connected close to agricultural feeders and substations. Feeder solarisation cuts night-time operations, diesel dependence, upstream loading and technical losses, and it improves voltage, supply predictability and farmer safety. Farmer welfare, DISCOM sustainability and climate objectives therefore move together.

Solar tariffs discovered under the leading state programmes generally sit below conventional procurement benchmarks. The comparison that matters, though, is against each utility's own marginal or avoidable cost. That assessment has to weigh existing fixed obligations, seasonal demand, curtailment, balancing cost and storage need. Solarisation therefore belongs inside resource adequacy planning, phased to what each utility can absorb.

The Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) provides the national architecture through decentralised plants (Component A), stand-alone off-grid pumps (Component B), and individual pump or feeder-level solarisation (Component C). Progress is strongest under Component B, while Components A and C continue to face land, finance, grid-readiness and state-funding constraints.

Solarisation models and commercial choices

The choice of model follows the operating context of the feeder, the farmer and the utility. Feeder level solarisation (FLS) suits feeders where agricultural load is concentrated, the feeder is segregated, the substation is technically ready, and land lies close to the grid. It scales well, since a single plant serves many consumers while leaving the existing farmer service interface untouched.

Individual pump solarisation (IPS) fits farms where farmers can host systems, and where metering, settlement, maintenance and surplus power purchase arrangements can be run reliably.

Off-grid pumps serve remote farms and areas that are unelectrified or poorly supplied. Deployment there needs to be tied to groundwater safeguards, crop choice and irrigation efficiency. Rooftop solar remains complementary, supporting households, rural buildings and prosumers while the agricultural feeder is served separately.

The commercial model matters as much as the technical one. The capital expenditure (CAPEX) model gives the utility ownership and asks in return for upfront capital and operating capability. The renewable energy service company (RESCO) model shifts financing, construction and operations to the developer under a long-term power purchase agreement (PPA). It rests, in turn, on tariff viability, enforceable contracts, land certainty, grid connectivity and payment security.

The right model is therefore the one that matches load concentration, feeder segregation, land availability, finance, institutional capability, risk allocation and groundwater conditions.



Maharashtra case study, mission-mode transformation

Maharashtra's experience shows what a state learns by building at scale. Mukhyamantri Saur Krushi Vahini Yojana (MSKVY) 1.0 established the feasibility of feeder solarisation and, in the same stroke, exposed the constraints that kept recurring, namely small and fragmented projects, unprepared substations, land and approval delays, inconsistent application of exemptions and developer concerns over payment risk. MSKVY 2.0 converted these lessons into a programme built on a dedicated nodal entity, mission-mode governance, pre-identified land and substations, cluster-based procurement, digital lifecycle monitoring, payment security and community incentives.

- Scale and progress: The revised target is about 16 GW, and as of 17 June 2026, the programme had tendered 15,714 MW, issued work orders and power purchase agreements for 15,404 MW, and commissioned 4,637.6 MW across 969 projects for 1,266,453 agricultural consumers.
- Bankability and delivery: Geographic information system (GIS)-enabled land mapping, a data room, district-level special purpose vehicles, advance connectivity, a single-window portal, tariff-based bidding and a revolving payment security fund together reduce pre-construction and counterparty risk.
- Stakeholder alignment: Private land lease rent of ₹1.25 lakh per hectare per year with 3% annual escalation, Gram Panchayat grants, substation-strengthening support and early-commissioning incentives hold local and developer participation in place.
- Grid and digital backbone: Feeder segregation, SCADA integration, substation-level monitoring, milestone dashboards, distribution strengthening and planned distributed BESS let the network absorb decentralised solar reliably.



Maharashtra has widened the reform beyond feeder solarisation. Magel Tyala Saur Krushi Pump Yojana (MTSKPY) targets 500,000 state-supported solar pumps with low beneficiary contributions, two-month installation discipline and five-year maintenance support. PM-KUSUM Component B under the Maharashtra State Electricity Distribution Company Limited (MSEDCL) has reached 295,000 installations, while MTSKPY has reached 359,488 against its target of 500,000. Lift irrigation solarisation, residential rooftop solar under the Swayampurn Maharashtra Awasiya Rooftop (SMART) scheme and solar village initiatives extend the transition across several rural energy use cases.

The proposed demerger of the agricultural distribution business into MSEB Solar Agro Power Limited (MSAPL) is the most structural feature of the Maharashtra pathway. It creates a dedicated institutional platform for agricultural supply, feeder solarisation, subsidy transparency, service accountability and separate financial governance. The Government of Maharashtra has proposed the demerger as part of a wider transition framework that also carries financial restructuring of MSEDCL and a proposed listing of the non-agricultural business. Taken together, the three moves sharpen operational focus, tighten balance sheet discipline and draw a clear line of accountability across agricultural and non-agricultural supply.

Rajasthan case study, flexible developer-led deployment

Rajasthan shows a second route to decentralised agricultural solarisation, one that is flexible and developer-led. The state has strong solar resources, long rural networks, deep groundwater dependence and high subsidy exposure. More than 40% of wells are reported deeper than 20 metres, and agriculture accounts for about 41% of electricity consumption. Solarisation therefore works on farmer service, subsidy pressure, DISCOM sustainability and renewable deployment at once.

The long-term decentralised ambition is about 17 GW across some 6,560 plants serving more than 1.4 million agricultural consumers. As of 24 June 2026, power purchase agreements covered about 10.63 GW across Components A and C, and 4,558 MW had been commissioned. That figure carries 1,137 MW under Component A and 3,422 MW under feeder-level Component C, which together serve around 220,000 agricultural consumers.

Rajasthan retained individual project tendering where cluster bids ran up against contiguous land constraints. The choice answered market and land conditions as it found them. The state then built support around that choice, through land registration, joint technical surveys, defined interconnection at 11 kV or 33 kV, gross metering, remote monitoring, standard documentation, letters of credit and escrow arrangements. District-level right of way (RoW) support, lender engagement and an 18-step Contract Monitoring System (CMS) completed the package.

The Rajasthan lesson is that policy ambition must be converted into market-ready packages. Developer participation improves when land information arrives early, payment risk falls, RoW is cleared quickly, tariffs carry regulatory certainty and progress is tracked continuously from letter of intent to commissioning.

Rajasthan therefore complements Maharashtra by showing that flexibility in procurement matters as much as scale in it.



Recommended implementation framework

The two state cases lead to one conclusion about implementation. Sanctioned capacity becomes reliable agricultural service only when demand, land, grid, contracts, finance, community acceptance and operations are closed in sequence. The framework below is therefore built as a stage-gated programme, with clear ownership and measurable controls at each gate.

- **Planning:** This phase defines service, financial and renewable objectives, reconciles feeder consumption and peak demand, ranks substations by load, land, bay and hosting capacity, selects the delivery model and names an accountable programme owner. It converts policy intent into a bankable portfolio.
- **Development:** This phase prepares a substation-wise inventory, verifies land title and coordinates, assesses access and route constraints, completes technical studies, mobilises stakeholders and settles standard documents before procurement. It clears the risks that would otherwise surface after award.
- **Procurement:** This phase sets realistic tender packaging and specifies delivery point, capacity utilisation factor, land responsibility, evacuation responsibility and commissioning timelines. It secures the tariff route and embeds payment security. Technical readiness becomes a set of bankable contracts at this gate.
- **Execution:** This phase tracks each project from award to commercial operation, supports financial closure, resolves land and right of way issues, builds evacuation works in parallel, completes statutory approvals and brings metering, billing and performance monitoring into use. It converts contracted capacity into service delivery.



- **Grid augmentation and BESS planning.** This runs as a dedicated technical workstream alongside the four phases. Hosting capacity studies are completed before procurement, and storage is deployed where solar shifting, peak shaving, ramp control, curtailment reduction, voltage support, reliability improvement or network deferral carries a defined value. Storage then earns its place as a system solution.

Five controls hold the framework together. Land and grid data are bid-ready before procurement. The delivery institution carries end-to-end accountability. Payment flows are protected. Procurement matches land conditions and market appetite. A single digital control architecture covers approvals, construction, network readiness, commissioning, billing and service outcomes.

Introduction, context and policy imperative

1.1 Importance of agriculture in the national and state context

Agriculture remains economically and socially important in India because it contributes materially to national output, supports livelihoods at scale and shapes the demand profile of rural electricity systems.

It contributed about 17.94% of national gross value added (GVA) in FY25, or ₹53.85 lakh crore (about ₹54 trillion)[1] of a total GVA of ₹300.22 lakh crore, and continues to employ around 46%[2] of India's workforce, even as its share of GDP has fallen with the growth of industry and services. No other sector is as deeply integrated into India's livelihoods or into its land and water resources.



[1] GVA at Basic Prices (Base Year: 2011-12) Current Prices, Handbook of Statistics on Indian Economy 2024-25

[2] Percentage distribution of workers in usual status, Periodic Labour Force Survey (PLFS) Annual Report July 2022 - June 2023

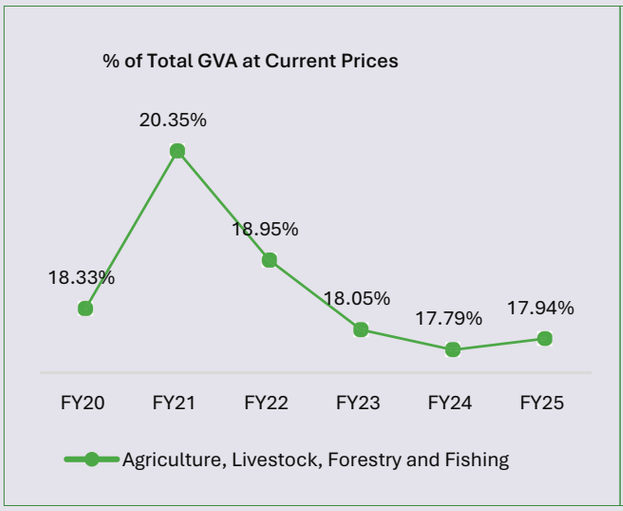

Figure 1.1 Sectoral share of India's gross value added, FY25

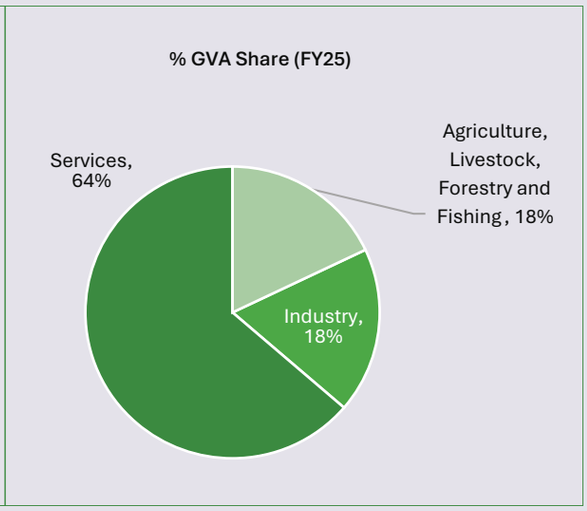

Figure 1.2 Agriculture, livestock, forestry and fishing as a share of total GVA at current prices, FY20 to FY25

The energy intensity of Indian agriculture has grown sharply with the spread of groundwater irrigation. As of FY23,[3] net irrigated area stood at 79 million hectares, or around 56% of the net sown area. Groundwater accounted for about 62% of that area. Net irrigated area has trebled over six decades, and groundwater extraction explains most of that growth, its own share having nearly doubled across the same period.

Electrification of pump sets followed, and with it a sharp rise in the number of electrically operated groundwater extraction devices. Subsidised electricity appears to have encouraged the spread of electric pumps, alongside rising electrification rates and higher diesel costs, and it has widened irrigation access for many smallholders. As of 2022, around 32 million pumps[4] ran on diesel, electric and solar power, making India the world's largest user of groundwater for irrigation.

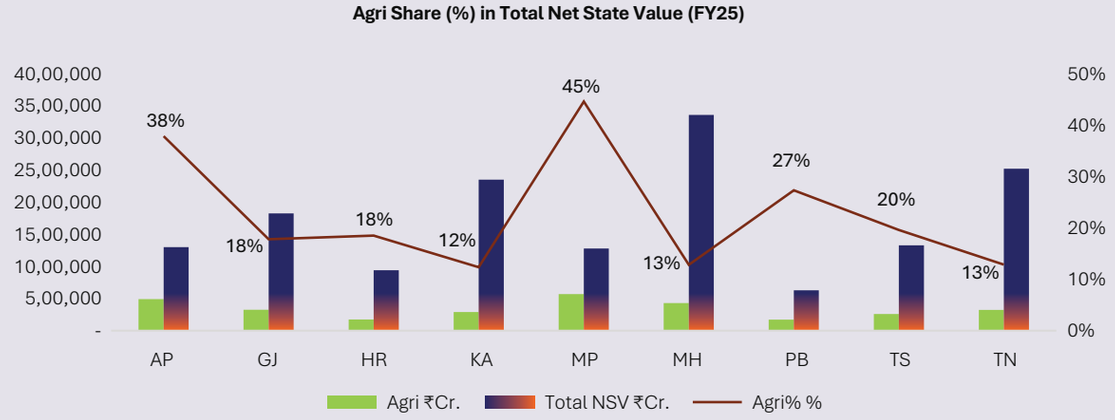

Figure 1.3 Agriculture share in total net state value across major agrarian states, FY25

This concentration of energy-intensive, groundwater-dependent agriculture is geographically uneven. Pump-set density runs high in Punjab, Haryana, Maharashtra, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Telangana and Karnataka, precisely the states that also report the highest agricultural power subsidies and DISCOM financial stress.

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[3] Annual Report 2024-25, Department of Agriculture & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, GoI

[4] Estimated stock of agricultural irrigation pumps in India, 2010-2022, International Energy Agency (IEA)

1.2 Why agriculture solarisation

Agriculture is the foundation on which India's economy, food security and social fabric rest. It is at once the nation's largest employer, the primary source of livelihood for the majority of its population, and the sector most exposed to the reliability and affordability of electricity. That foundational role is what makes agricultural solarisation a structural economic and social reform, and it is worth grasping before the case for solarisation itself is examined.

The availability of reliable daytime electricity for irrigation pump sets directly determines three things.

a) Whether farmers can plant and harvest in alignment with optimal crop calendars.

b) Whether groundwater, the dominant water source for over two-thirds of India's irrigated area, can be reliably accessed.

c) Whether the productivity and income gains of the Green Revolution can be sustained and extended to the remaining rainfed agricultural areas.

India's pump-sets, predominantly groundwater-based, form one of the most energy-intensive agricultural systems in the world. Demand for agricultural electricity is concentrated in India's most agriculturally intensive and economically vulnerable districts. The states with the highest pump-set densities are also the states carrying the heaviest DISCOM financial stress from agricultural electricity subsidies. Solarising their agricultural feeders is therefore a national economic priority as much as a state-level energy decision.

A report by the International Institute for Sustainable Development (IISD) on Scaling Solar Power for Irrigation in India[5] notes that shifting away from heavily subsidised agricultural electricity can relieve pressure on DISCOM finances, while contributing to cleaner energy and better irrigation reliability.

1.2.1 The scale of the problem

India's agricultural sector is the backbone of its rural economy, employing over 46% of the workforce and supporting hundreds of millions of livelihoods. Reliable electricity for irrigation is central to agricultural productivity, food security and farmer income. The manner of its supply, however, has left deep structural distortions across India's power sector. Holding affordable agricultural supply and the financial health of distribution utilities in the same frame has become one of the sector's defining problems. The principal challenges are set out below.

[5] Scaling Solar Power for Irrigation in India, Lessons from PM-KUSUM Components A and C-FLS, IISD REPORT, April 2026



Power supply challenge

To manage peak demand and avoid carrying large agricultural loads during high-value daytime hours, Indian DISCOMs have historically rostered agricultural feeders in regulated time blocks, shifting them to off-peak or night supply. The reasoning is one of system economics and load management. Agricultural demand is heavily subsidised and largely unmetered, so a DISCOM has every incentive to keep that low-revenue load away from expensive peak periods. Feeder separation, a central plank of the revamped distribution strategy, was designed to split farm load from other rural demand, so that agricultural supply could be rostered on its own and non-agricultural consumers could draw more reliable power. Even so, the way agricultural supply works on the ground continues to weigh on farm productivity, farmer safety and rural economic security.

01 **Irregular supply timings.** Farmers in several states receive limited supply windows, commonly of 8 to 10 hours, and they may have to run irrigation pumps late in the evening or through the night. The result is operational inconvenience, physical drudgery and real safety risk, particularly during extreme weather or in areas exposed to wildlife and other night-time hazards

02 **Power quality and network constraints.** Agricultural consumers in rural areas frequently face unreliable electricity supply, including voltage fluctuations, interruptions and feeder-level constraints. These reduce irrigation pump performance, damage motors and electrical equipment, disrupt irrigation schedules during critical crop-growth stages and push up repair and maintenance costs. Farm productivity, crop yields and farmer incomes follow.

03 **Dependence on diesel-based irrigation.** Where grid access is unreliable, many farmers still depend on diesel-powered pumps for irrigation. Diesel pumping raises the cost of cultivation, leaves farmers exposed to fuel-price volatility and adds to local air pollution and greenhouse gas emissions.

04 **Barriers to adoption of modern irrigation technologies.** Reliable and predictable electricity is essential if modern irrigation systems are to work properly. Inconsistent supply limits how efficiently farmers can run them, weakens the business case for investing in automation and narrows the scope for improving water-use efficiency, crop productivity and climate resilience.

A study by the Prayas (Energy Group)[6] on Telangana's round-the-clock power supply to the agriculture sector found that the fiscal subsidy burden rose as conventional supply was extended. Longer supply hours also left the underlying service quality problems in place, with frequent outages, distribution transformer failures and slow repairs all persisting. Hours alone, in short, do not fix reliability at the last mile.

DISCOM financial stress

Agricultural power supply remains a key source of structural financial stress for distribution utilities. Subsidised or free electricity supports farm incomes, and the low tariff recovery that comes with it leaves a persistent mismatch between the cost of supply and the revenue realised. Historically, DISCOMs have relied on state subsidies and cross-subsidies from industrial and commercial consumers to bridge this gap. That model is growing fragile as high-paying consumers migrate to open access, captive power and alternative energy options, shrinking the cross-subsidy pool. Any delay or inadequacy in subsidy release therefore hits DISCOM liquidity, limits capital expenditure, weakens network reliability and sustains a cycle of losses, poor supply quality and consumer dissatisfaction. Five factors carry most of this pressure.

[6] 24 x 7 free agriculture supply: Lessons from Telangana's unique initiative, Prayas, April 2020

[7] Report on Performance of Power Utilities 2024-25, PFC, February 2026

01 **High subsidy burden.** Agricultural and selected consumer-category tariffs in most states are kept below cost, and the resulting gap is met through budgeted subsidy payments, grants or other support commitments. The financial stress therefore moves from the DISCOM balance sheet to the state budget, where it remains. The Report on Performance of Power Utilities 2024-25[7] puts the ACoS-ARR gap on a tariff subsidy received basis at ₹0.31/kWh in FY23, improving to a surplus of ₹0.03/kWh in FY25, with tariff subsidy received contributing about 21.09% of total revenue. Part of the sector's apparent financial recovery is therefore still underwritten by subsidy receipts rather than by fully cost-reflective tariffs.

02 **Widening ACoS–ARR gap.** The average cost of supply (ACoS) incurred by DISCOMs is considerably higher than the average revenue realised (ARR) from the agricultural category. The mismatch persists, undermining the financial sustainability of utilities and feeding recurring losses.

03 **Delayed subsidy reimbursements.** State governments compensate DISCOMs for subsidised agricultural supply, though the reimbursements are frequently late. The delays create cash-flow constraints, raise working capital requirements and weaken the liquidity position of utilities.

04 **Cross-subsidisation of commercial and industrial consumers.** To offset losses arising from agricultural supply, DISCOMs rely on higher tariffs for commercial and industrial consumers. The practice bridges part of the revenue gap, and it raises the cost of electricity for productive sectors and erodes industrial competitiveness.

05 **Higher cost of rural power supply.** Agricultural consumers are dispersed across vast rural areas, requiring extensive transmission and distribution infrastructure. High network costs, technical losses and low revenue recovery together aggravate the financial burden on DISCOMs.

1.3 Why is solar a strategic solution

Solar PV aligns closely with the core challenges of agricultural electricity supply. By generating power through daylight hours, feeder-level solarisation gives farmers more reliable irrigation supply while easing night-time rotational scheduling on properly segregated feeders. Competitively discovered solar tariffs point to a lower long-term cost of serving subsidised agricultural load, and to lighter pressure on the state subsidy bill. The saving varies by utility, depending on its power mix, electricity purchase cost, grid and network condition, and the cost of balancing and storage required to integrate renewable generation.

Daytime supply

Agricultural feeder solarisation matches farmers' preference for reliable daytime irrigation power. Maharashtra's Mukhyamantri Saur Krushi Vahini Yojana (MSKVY) 2.0 offers the blueprint, supplying stable daytime electricity to agricultural consumers through decentralised solar projects within a five to 10 km radius of agriculture-dominated distribution substations. Nationally, the agricultural sector accounts for around 17% to 20% of total electricity consumption, with demand heavily concentrated in major agrarian states such as Maharashtra, Punjab and Rajasthan.[8] Irrigation pump load is highly schedule-flexible, since the timing of operation can shift without affecting crop yields. Dedicating localised solar generation to agricultural feeders therefore answers two grid challenges at once.

01 **Peak load shifting.** Daytime farming demand is met directly with low-cost generation.

02 Peak demand mitigation. Large irrigation loads come off the expensive evening peak, easing the burden on the utility grid.

[8] General Review 2025, All India Electricity Statistics, CEA, November 2025

Cost optimisation

The sustained decline in solar tariffs has turned solar into a mainstream power-procurement option, one that lowers long-term cost exposure for DISCOMs and consumers. Agricultural feeder solarisation has emerged as a credible cost-optimisation pathway for DISCOMs and state governments, particularly for meeting incremental demand and replacing high-cost purchases. Competitively bid solar tariffs in leading state programmes sit well below conventional power procurement benchmarks and the implied cost of serving subsidised agricultural load. Maharashtra's MSKVY 2.0 has seen tariffs of ₹2.82 to ₹3.10/kWh,[9] Gujarat's PM-KUSUM feeder solarisation approvals sit broadly at ₹2.15 to ₹3.00/kWh,[10] and Rajasthan's Rajasthan Electricity Regulatory Commission (RERC) approved tariffs range from ₹2.78 to ₹3.04/kWh.[11]

Calibrating the pace of solarisation

Solarisation works as a phased substitution, unit by unit, rather than a wholesale replacement of existing agricultural supply. DISCOMs need to assess their power portfolio mix if they draw on hydro stations or pit-head coal plants whose short-run marginal energy cost falls below that of solar generation. Displacing that generation at once yields little near-term saving, particularly where the utility still carries the fixed cost of the existing plant.

An economic assessment should therefore distinguish between average cost and marginal cost or avoidable cost. A solar tariff may sit below the utility's average cost of supply while still exceeding the variable cost of an existing plant. The comparison shifts again if the utility is procuring costly short-term power, facing fuel risk or considering new capacity to meet its agricultural demand.

Where agricultural supply must be firmed at hours beyond daylight, DISCOMs may evaluate battery energy storage systems (BESS) or pumped storage projects (PSP) as a demand response tool. For incremental agricultural demand, solar combined with appropriately sized storage or flexibility may prove more cost-effective than adding new conventional capacity.

This approach holds the strategic case for agricultural solarisation intact, while keeping implementation phased, financially prudent and aligned with each DISCOM's resource adequacy planning.

Energy security

Domestic manufacturing growth strengthens India's energy-security case. India's solar manufacturing base has expanded rapidly, supported by a policy push towards indigenous production and resilient domestic clean-energy supply chains.[12] According to the Ministry of New and Renewable Energy (MNRE), solar module manufacturing capacity nearly doubled from 38 GW in March 2024 to 74 GW in March 2025, while solar PV cell manufacturing capacity rose from 9 GW to 25 GW over the same period. The commissioning of India's first 2 GW ingot-wafer manufacturing facility in FY25 marks a further step towards deeper upstream integration in the solar value chain. This expansion reduces dependence on imported solar components, strengthens supply-chain resilience and widens India's capacity to support large-scale solar deployment through domestic manufacturing.

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[9] https://www.saurenergy.com/solar-energy-news/merc-fixes-generic-tariff-for-rooftop-solar-at-rs-2-82-unit

[10] https://www.saurenergy.com/solar-energy-news/pm-kusum-gujarat-discom-gets-the-lowest-tariff-of-rs-2-15-kwh

[11] https://www.energetica-india.net/news/rerc-approves-tariffs-for-22885-mw-solar-under-pm-kusum

[12] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2117501&reg=48&lang=2

Climate benefits

Climate and local environmental benefits further strengthen the case for agricultural solarisation. As per the Central Electricity Authority's CO_2 Baseline Database, Version 20.0, the FY24 weighted average grid emission factor adjusted for renewable energy is 0.727 tCO_2/MWh, equivalent to about 0.727 kg CO_2/kWh. Each unit of solar generation that displaces grid or thermal power therefore avoids around 0.727 kg of CO_2, subject to the marginal source being displaced.

India's clean-energy scale-up provides the broader national context. As of 31 May 2026, India's installed non-fossil capacity, including nuclear, stood at about 291.53 GW,[13] against the national target of achieving 500 GW of non-fossil fuel-based capacity by 2030. Within this transition, PM-KUSUM and agricultural feeder solarisation offer one of the largest decentralised solar deployment opportunities across decentralised plants, standalone solar pumps, and solarisation of grid-connected agricultural pumps, including feeder-level solarisation.

Diesel pump replacement delivers direct rural environmental benefits. PM-KUSUM's Component B supports standalone solar agricultural pumps. Official parliamentary reporting[14] indicates that, as of 31 July 2025, the installation of around 853,000 solar pumps under Component B contributed to diesel pump replacement and an estimated 6.6 million tonnes of CO_2 mitigation across PM-KUSUM components. Beyond the carbon benefit, replacing diesel irrigation pumps cuts local combustion-related pollutants, including particulate emissions, improving the environmental profile of agricultural energy use in rural communities.

1.4 National policy architecture, the PM-KUSUM scheme

The Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) scheme is the Government of India's flagship initiative for agricultural solarisation. Launched in 2019, it works to strengthen farmers' energy security, promote decentralised renewable energy generation, reduce dependence on diesel-based irrigation and improve the sustainability of agricultural power supply. It supports decentralised solar generation through feeder-level solar plants, standalone solar pumps and the solarisation of existing grid-connected agricultural pumps.

From a DISCOM perspective, PM-KUSUM offers a route to replacing conventional agricultural power procurement with locally generated solar energy. The scheme supports subsidy reduction, enables reliable daytime power supply, lowers technical losses and eases compliance with renewable purchase obligations (RPOs). By aligning farmer incentives, utility economics and renewable energy deployment, PM-KUSUM sets a framework for transforming how agricultural electricity is supplied.

[13] https://mnre.gov.in/en/physical-progress/

[14] https://sansad.in/getFile/annex/268/AU2691_8eZjWW.pdf?source=pqars



Component-wise progress is set out below.

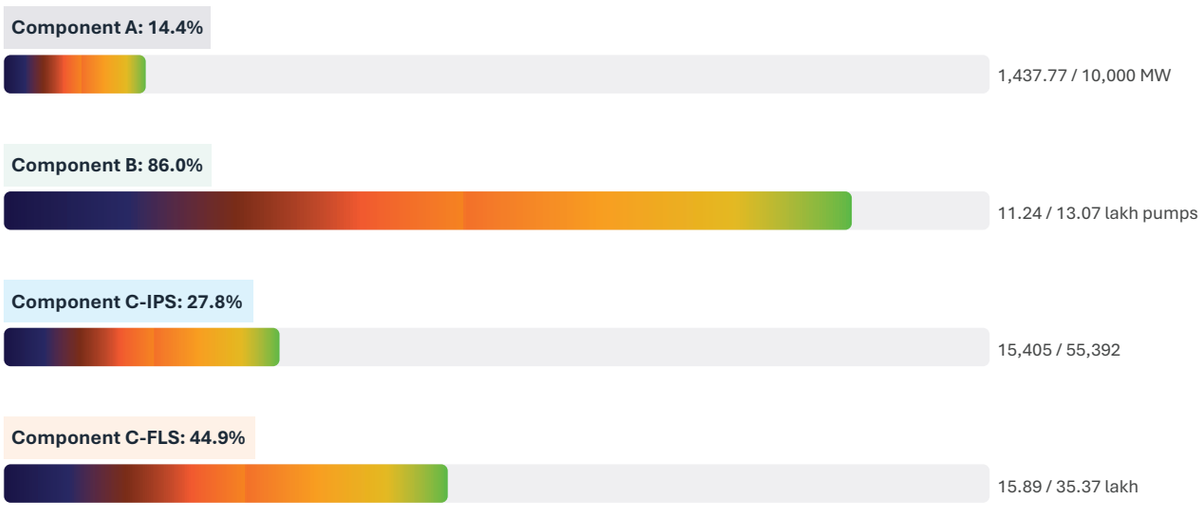
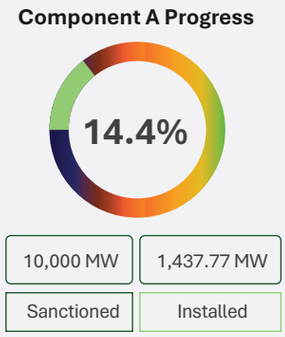


Figure 1.4 PM-KUSUM, component-wise progress against sanctioned targets

Component A

Objective: Setting up of decentralised ground-mounted or stilt-mounted grid-connected solar and other renewable energy-based power plants on farmers' land.

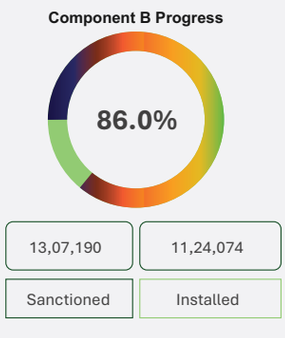


- **Rajasthan** has emerged as the leading contributor of commissioned solar capacity.
- Certain states like **Himachal Pradesh, Tamil Nadu,** and **Uttar Pradesh,** have achieved full utilisation of their sanctioned capacities.
- Several states, including **Assam, Gujarat, Odisha,** and **Tripura,** have reported no commissioned capacity despite receiving sanctions.
- Component A remains the least progressed component under PM-KUSUM.

Figure 1.5 PM-KUSUM Component A, sanctioned against installed capacity

Component B

Objective: Installation of standalone solar-powered agricultural pumps in off-grid areas.



- States such as **Gujarat, Arunachal Pradesh, Nagaland, Tamil Nadu,** and **Kerala** have achieved 100% implementation of sanctioned targets.
- Large agrarian states like **Maharashtra, Rajasthan, Haryana, and Punjab** have recorded achievement levels exceeding 95%.
- Component B is the best-performing component under PM-KUSUM in terms of implementation progress.

Figure 1.6 PM-KUSUM Component B, sanctioned against installed pumps

Component C (IPS)

Objective: Solarisation of grid-connected agricultural pumps, enabling farmers to earn additional income by selling surplus power to DISCOMs.

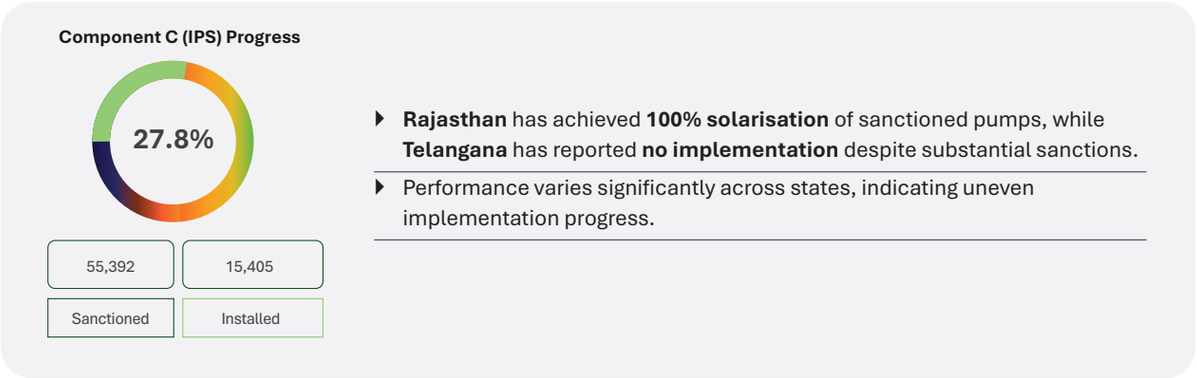


Figure 1.7 PM-KUSUM Component C (IPS), sanctioned against installed pumps

Component C (FLS)

Objective: Solarisation of agricultural feeders to provide assured daytime electricity.



Figure 1.8 PM-KUSUM Component C (FLS), sanctioned against installed capacity

Official parliamentary reporting records that, under Component A and Component C, the delays arose largely from the unavailability of low-cost finance, the requirement of collateral by banks and land-related bottlenecks. Under Component B, the main constraint has been timely and adequate state share. Some states have also taken time to conclude tenders, delaying installations further.



1.5 The solar advantage

Agricultural solarisation strengthens energy security by enabling reliable daytime irrigation supply and reducing dependence on centralised generation. It improves financial sustainability where it displaces high-cost procurement, and it advances climate objectives by replacing fossil-fuel-based electricity and diesel irrigation with clean solar energy.

Energy security

01 **Reliable daytime power for irrigation.** Agricultural solarisation enables assured daytime electricity supply for irrigation, easing reliance on night-time supply schedules and improving the quality, predictability and convenience of power for farmers.

02 **Reduced reliance on centralised power supply.** By enabling generation at the feeder, substation or farm level, solarisation reduces dependence on distant power plants and long transmission networks, strengthening local energy availability.

03 **Lower network losses.** Localised solar generation reduces transmission and distribution losses typically associated with serving geographically dispersed agricultural loads, improving overall system efficiency.

04 **Improved rural grid reliability.** Feeder-level solarisation reduces network congestion, improves voltage profiles and lowers stress on rural distribution infrastructure, strengthening supply reliability.

05 **Protection from fuel and supply-side volatility.** Solar power reduces exposure to fuel price fluctuations, conventional power shortages and supply-chain disruptions, supporting long-term energy security for both DISCOMs and agricultural consumers.

Financial benefits

01 **Lower cost of serving agricultural demand.** Solar power is among the most cost-competitive sources of new electricity generation in India. Solarising agricultural loads reduces the cost of supply compared with conventional power procurement.

02 **Reduction in subsidy burden.** Where solarisation lowers procurement and delivery costs, it reduces agricultural subsidy requirements, easing fiscal pressure on state governments and improving power-sector financial sustainability.

03 **Avoidance of costly power purchases.** Daytime solar generation aligns well with irrigation demand and offsets the need for expensive short-term or peak-period power purchases by DISCOMs.

04 **Supplementary income for farmers.** Under grid-connected solar models, farmers can export surplus electricity to the grid, creating an additional and predictable income stream.

05 **Improved DISCOM operational and financial performance.** Reduced procurement costs, lower technical losses, better feeder management and improved load predictability strengthen DISCOM finances and operational efficiency.

[15] https://www.sansad.in/getFile/loksabhaquestions/annex/184/AU4298_C45uM0.pdf?source=pqals

Climate and sustainability advantages

01 **Reduction in greenhouse gas emissions.** Replacing fossil-fuel-based electricity and diesel-powered irrigation with solar energy substantially reduces emissions from the agricultural energy-use segment.

02 **Support for India's renewable energy transition.** Agricultural solarisation contributes to India's clean energy goals and supports utilities in meeting renewable energy procurement obligations.

03 **Incentivising efficient groundwater use.** Grid-connected solar models encourage more efficient water use by allowing farmers to monetise surplus electricity rather than putting excess power to pumping.

04 **Lower environmental footprint of agriculture.** Solar-powered irrigation reduces dependence on conventional energy sources, supporting cleaner and more sustainable agricultural practices.

05 **Opportunity for agri-voltaic models.** Solar installations can be integrated with agricultural activities, enabling dual use of land for crop cultivation and clean energy generation, improving land-use productivity.

1.6 Grid and network constraints

The rapid growth of renewable energy is changing how India's power system is planned and run. The network is evolving from a predominantly centralised and unidirectional structure into one that must accommodate geographically concentrated utility-scale renewable generation as well as distributed generation connected at sub-transmission, distribution and consumer levels. Solar and wind output is weather-dependent and increasingly inverter-based, which calls for greater network flexibility, forecasting capability, voltage support, reserves and real-time operational visibility.

Distributed solar reduces daytime drawal from upstream networks where generation is aligned with local demand. At higher penetration, however, it brings reverse power flow, voltage rise, protection-coordination issues, power-quality concerns and increased reliance on upstream networks to absorb surplus generation.

The principal challenges follow.

Key challenges

- Mismatch between generation and transmission timelines. Renewable energy projects typically have shorter development and commissioning timelines than the associated transmission infrastructure. Delays in establishing pooling substations, dedicated transmission lines, grid-connection bays, transformation capacity or upstream evacuation corridors lead to delayed connectivity, restricted evacuation or temporary underutilisation of commissioned renewable capacity.
- Transmission congestion. Renewable generation may be technically available but unable to reach load centres because of inadequate transfer capability or constraints in transmission lines, substations, transformers or associated evacuation corridors. These arise from thermal-loading limits, voltage considerations, contingency-security requirements or system-stability conditions.
- Renewable energy curtailment. Curtailment becomes necessary where renewable generation cannot be absorbed by local demand, securely exported through the upstream network or balanced within prevailing system-security limits. It reduces billable generation and weakens project revenues and cash-flow predictability.
- Right of way and delayed approvals.

Transmission projects are delayed by right of way disputes, forest and wildlife clearances, land requirements for substations and tower foundations, statutory approvals, infrastructure crossings, route realignment and local stakeholder concerns.

- Grid security and flexibility. Rising penetration of inverter-based renewable generation requires adequate operating reserves, flexible generation, energy storage or demand-response capability, reactive-power and voltage support, fault-ride-through compliance, accurate forecasting and scheduling, and enhanced real-time monitoring. These hold grid stability, reliability and secure system operation under changing generation and demand conditions.

A further set of challenges is specific to agricultural solarisation.

- **Feeder capacity and substation hosting limits.** Agricultural feeders were designed primarily to supply pump loads and will not necessarily accommodate substantial generation. A feeder carrying a solar plant needs adequate hosting capacity. Where the connected capacity exceeds local load or feeder capability, the result is voltage rise, reverse power flow and protection malfunction. PM-KUSUM itself requires substation capacity identification and technical-feasibility assessment.
- **Reverse power flow.** Under individual grid-connected pump solarisation, surplus solar electricity flows from farmers' installations back into the distribution network. That reverses the conventional direction of power flow and calls for bidirectional meters, updated protection systems, voltage regulation and feeder-level monitoring.
- **Seasonal challenge.** Solar generation and agricultural demand fall out of step across the day and across the season. Generation arrives during daylight hours, while irrigation demand depends on crop type, irrigation practice, groundwater depth, rainfall and seasonal agricultural activity. When irrigation demand falls, through the rains or outside peak cropping seasons, solar output from feeder-level or individual pump solarisation can exceed the local feeder load if capacity is not properly matched with demand. In such cases, the excess power must either be absorbed by nearby loads, exported upstream through the distribution network, stored or curtailed. Therefore, feeder-level load assessment, substation capacity mapping and voltage management are essential before commissioning agri-solar projects.

As renewable penetration rises, transmission systems become active enablers of the energy transition rather than passive carriers of electricity. Adequate transmission planning, grid flexibility, storage integration, digital monitoring and coordinated operation between transmission and distribution systems are essential if renewable energy is to be absorbed reliably and economically. The Government has accordingly prepared transmission plans for integrating 500 GW of renewable capacity by 2030, and is implementing Green Energy Corridors, Renewable Energy Management Centres and associated control infrastructure.

Solarisation models

2.1 Model overview

India's solarisation pathway has grown around two parallel national priorities: decarbonising agricultural power consumption and expanding distributed renewable energy at the consumer level. In agriculture, the flagship framework is PM-KUSUM, which promotes decentralised renewable energy through three routes: decentralised grid-connected plants (Component A), stand-alone off-grid solar pumps (Component B), and solarisation of grid-connected agricultural pumps, including Feeder Level Solarisation (FLS), under Component C. Together these reduce diesel use, improve farmer energy access, lower subsidy burdens on state utilities, and create additional income streams for farmers.

Table 2.1 Solarisation models, operating context and PM-KUSUM component mapping

Model	Context	Who Benefits	PM-KUSUM Component
Feeder-level solarisation (FLS)	▪ Dense agricultural areas ▪ Segregated feeders ▪ Substation proximity	▪ All farmers on the feeder ▪ DISCOM (lower purchase cost)	Component A/Component C (FLS)
Off-Grid Solar Pump	▪ Remote areas without reliable grid ▪ Isolated bore wells ▪ Off-grid farms	▪ Individual farmers (no electricity bill) ▪ DISCOM (reduced load)	Component B
Rooftop Solar (RTS)	▪ Residential/farm buildings with roof access ▪ Grid-connected areas	▪ Household / farm prosumer (bill reduction) ▪ DISCOM (deferred capacity)	(PM Surya Ghar; state-oriented RTS schemes)

The business architecture matters as much as the technical model. Two financing structures now carry most distributed solar deployment in India.

The CAPEX model, under which the user or beneficiary owns the asset after making an upfront investment.

The RESCO model, under which a third-party developer finances, owns and operates the system while the user pays for energy services under a contract.

These choices shape adoption, especially where affordability, utility payment risk and operational capability vary across states and consumer categories.

2.2 Feeder level solarisation (FLS)

2.2.1 Why FLS and how it works

FLS has emerged as a response to structural challenges in agricultural electricity supply. Agriculture is commonly supplied at highly subsidised tariffs and, in many states, through restricted or non-daytime supply schedules, while DISCOMs and state governments bear substantial subsidy and power procurement burdens. FLS enables states to solarise a portion of agricultural electricity supply at the feeder or substation level, easing long-term power procurement and subsidy pressures, improving daytime supply reliability, and supporting cleaner agricultural electricity.

Under FLS, the DISCOM is the implementing agency. It first estimates the annual electricity requirement of an agricultural feeder (or a cluster of feeders) and then procures or develops a solar power plant sized to meet that annual energy demand.

The plant connects at 11 kV or at the higher-voltage side of the distribution substation, depending on land availability and technical feasibility, and serves either a single agricultural feeder or multiple feeders emanating from the same substation.

MNRE permits FLS to be implemented under either a CAPEX mode or a RESCO mode, giving states the choice between upfront public investment and outsourced private-development models. At the national level, FLS has moved beyond pilot-stage policy design into large-scale sanctioned deployment, though actual implementation remains uneven across states.

2.2.2 FLS compared with individual pump solarisation

From a design perspective, the key difference between FLS and Individual Pump Solarisation (IPS) is the unit of intervention. FLS is sized for the aggregate annual demand of an agricultural feeder/feeder cluster, whereas IPS installs solar PV at the individual pump level. Under PM-KUSUM Component C, IPS permits solar capacity up to two times the pump capacity in kW, with surplus generation eligible for purchase by the DISCOM.

The two models also differ in institutional logic.

IPS is farmer-centric. It places generation at the farm level, enables direct self-consumption, and creates an incentive for efficient electricity use where surplus export is remunerated.

FLS is utility-centric. It preserves the existing end-use structure while changing the source of electricity upstream, which makes it easier to scale across large agricultural loads without asking for per-farmer asset ownership or maintenance capability.

FLS generally works better where feeders are segregated and agricultural demand is spatially clustered, because one plant can serve many consumers and reduce per-unit transaction costs. IPS suits settings where individual farmers are willing and able to host/ co-finance systems, and where metering, billing and export arrangements can be implemented reliably. MNRE's inclusion of FLS in Component C was partly a recognition that states needed a more scalable pathway than only pump-wise solarisation.

From a risk perspective, IPS places more technical and behavioural responsibility at the farm level, while FLS concentrates implementation risk with DISCOM and developer. FLS cremains easier to administer systemically than millions of dispersed individual installations where farmer awareness, maintenance quality and payment settlement become binding constraints.

2.3 Off-grid solar pump

Off-grid solar pumps are primarily addressed under PM-KUSUM Component B, which supports the installation of stand-alone solar agricultural pumps up to 7.5 HP in off-grid areas where grid supply is unavailable. The model substitutes diesel pumps or unelectrified irrigation systems and itmatters most in remote rural regions where feeder extension is costly or slow.

The national policy rationale is straightforward. Stand-alone pumps improve energy access, irrigation reliability and resilience, while reducing diesel consumption and local pollution. Under the scheme, the Central Government provides 30% central financial assistance (CFA) in most states (and 50% in North-Eastern, hilly and island regions), states are expected to provide at least 30% subsidy, and the remaining share is borne by the farmer, often with access to bank finance that lowers the upfront contribution.

The PM-KUSUM portal reports that as of 31 May 2026, more than 1,124,000 off-grid solar pumps had been installed against sanctions of over 1,307,000, making Component B one of the more advanced parts of India's agricultural solarisation effort.

Off-grid pumps do require careful design safeguards. Solar pumping reduces the marginal cost of irrigation after installation, so deployment needs to be aligned with groundwater management, crop choice and irrigation-efficiency measures. IISD's solar irrigation work emphasises that solar irrigation belongs within the water, energy and food nexus rather than standing as an energy-access intervention.



2.4 Rooftop solar (RTS)

Rooftop Solar (RTS) is India's principal grid-connected distributed-solar model for households, institutions and buildings connected to the distribution network. At the programme level, MNRE's Grid Connected Rooftop Solar Programme targets a cumulative 40 GW of rooftop solar capacity, while the current flagship residential push is PM Surya Ghar Muft Bijli Yojana, launched in February 2024 to accelerate household adoption through capital subsidy support, a digital national portal, vendor selection, DISCOM-linked workflows and easier access to finance.

For residential households, the PM Surya Ghar portal provides subsidy support of ₹30,000 per kW up to 2 kW, ₹18,000 per kW for additional capacity up to 3 kW, and a maximum subsidy of ₹78,000 for systems larger than 3 kW. The portal also maps system size to consumption bands, suggesting around 1–2 kW for households consuming 0–150 units per month, 2–3 kW for 150–300 units, and above 3 kW for higher consumption levels.

RTS plays a different role from agricultural solarisation. It reduces distribution losses, improves consumer-side energy resilience, and turns households and buildings into prosumers through net-metering or related arrangements. Under PM Surya Ghar, the Government has set a target of 10 million households by March 2027.

In national strategy terms, RTS works as a distributed-energy and distribution-sector reform instrument as much as a consumer subsidy programme. By encouraging local generation behind the meter, RTS complements utility-scale solar and agricultural solarisation, though its impact depends on DISCOM incentives, net-metering design, grid integration and consumer economics.



2.5 CAPEX model

The CAPEX model under PM-KUSUM works as a subsidy-supported ownership or investment route for agricultural solar assets, and it varies by component rather than running as a uniform consumer-financing model. Under Component A, CAPEX is more flexible and extends to farmer-owned, group-owned, cooperative, farmer producer organisations (FPO), water user associations (WUA) or panchayat led investments.

Under Component B, CAPEX is primarily a beneficiary-owned model. Farmers install stand-alone solar agriculture pumps in off-grid areas where grid supply is unreliable. The Central Government provides 30% CFA in most states, the State Government is expected to provide at least 30% subsidy, and the balance rests with the farmer, with bank finance available to reduce the upfront contribution.

Under Component C, individual pump solarisation, CAPEX is farmer-linked as well. Existing grid-connected agricultural pumps are solarised, with solar PV capacity of up to twice the pump capacity permitted. The result is a subsidised ownership model in which the farmer uses solar power for irrigation and can monetise excess generation, subject to state-level metering and settlement arrangements.

Under Component C (FLS), the DISCOM is the implementing agency which assesses the annual electricity requirement of an agricultural feeder or feeder cluster, and procures or develops a solar plant to meet that requirement. The government also supports DISCOMs financially on feeder separation, as a prior step at locations where agricultural feeders have not been segregated.





2.6 RESCO model

The RESCO model, run by a renewable energy service company, is a service-based solar deployment structure under which a third-party developer finances, installs, owns and generally operates the solar system, while the consumer pays only for the electricity or service delivered under a contractual arrangement such as a power purchase agreement (PPA).

Under Component C (FLS), MNRE permits feeder-level solarisation in RESCO mode as well. The developer brings the capital and supplies solar power to the DISCOM under a PPA, and the DISCOM uses that power to serve agricultural feeders.

Under Component A, PM-KUSUM permits decentralised renewable power plants to be developed by farmers, farmer groups, cooperatives, panchayats, FPOs and WUA. In the situations where these entities cannot arrange equity, they may develop the project through a developer or DISCOM, and the generated power is purchased by the DISCOM at a feed-in tariff determined by the state electricity regulatory commission (SERC). Component A therefore accommodates developer-led investment structures.

2.7 CAPEX and RESCO compared

From a policy perspective, RESCO is attractive under PM-KUSUM because it reduces the need for upfront public or farmer capital, brings professional development and operations and maintenance capability, and accelerates decentralised agricultural solarisation. Its relevance is strongest for Component A and Component C (FLS), where projects are larger, grid-connected and PPA-based.

RESCO shifts the constraint from upfront affordability to bankability. Deployment then depends on tariff viability, enforceable PPAs, payment security, land availability, grid connectivity, DISCOM responsiveness and standardised documentation. MNRE has identified escrow arrangements and letters of credit for Component A and Component C (FLS) as payment security mechanisms that support lender confidence, financial closure and timely commissioning.

Maharashtra case study

3.1. The state at a glance[16]

Maharashtra sits on the Arabian Sea coast, with a coastline of 877.97 km, and occupies the western and central peninsular region of India. Maharashtra ranks as India's second most populous state, third by geographical area and is one of its most economically significant regions, marked by high urbanisation alongside a large rural and agrarian population.

Maharashtra stands out as India's economic anchor, with the highest share in All-India nominal GDP at 14.0% in FY25, a projected FY26 nominal gross state domestic product (GSDP) of ₹5,100,597 crore (about ₹51 trillion), and expected real GSDP growth of 7.9% against India's 7.4%.

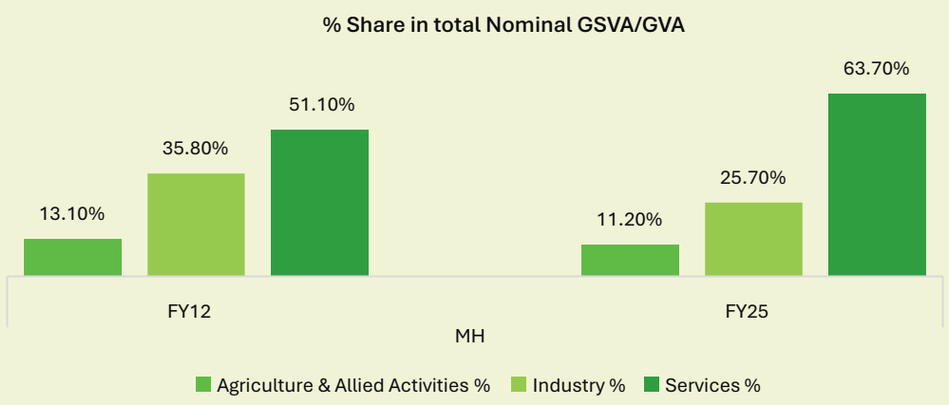


Figure 3.1 Maharashtra, sectoral share of nominal GSVA, FY12 and FY25

[16] Economic Survey of Maharashtra 2025-26

The state's economy is structurally services-led, with services contributing 63.1% of GSVA, followed by industry at 25.7% and agriculture and allied activities at 11.2% in FY25. Maharashtra's share of all-India nominal GDP in FY25 is expected to be the highest at 14.0%, followed by Tamil Nadu at 9.4% and Uttar Pradesh at 9.0%. The state also leads every Indian state on the socio-economic indicators below.

Higest share in FDI equity inflow	Share in Exports	Highest share of startups	Highest share in aggregated deposits
31.0%	**15.0%**	**17.0%**	**17.0%**

Figure 3.2 Maharashtra, standing across national economic indicators

3.2. State power sector scenario

3.2.1. Demand and supply scenario[17]

The state's peak demand reached 30.7 GW in March 2025, almost 50% higher than the 20.4 GW peak recorded in March 2015. Annual electricity supplied rose from 133 BU in FY15 to 201.8 BU in FY25, growth of about 52% across the decade. The state's own policy assessment projects electricity demand rising further to 260 BU to 270 BU by FY30 and around 350 BU to 360 BU by FY36. Long-term supply planning, resource adequacy and grid flexibility therefore sit at the centre of Maharashtra's power sector strategy.

On the supply side, Maharashtra has already made a significant transition from a conventional-generation-dominated system to a mixed portfolio with rapidly rising renewable energy capacity. The state's renewable capacity has grown nearly fivefold since FY14, reaching about 31.3 GW by January 2026, with solar the leading contributor. That growth brings operational challenges with it, since solar and wind generation are variable and must be integrated with transmission planning, storage and demand-side flexibility. Maharashtra's Renewable Energy and Energy Storage Policy accordingly targets 50% of electricity demand from renewables by FY30 and 65% by FY36, calling for around 100 GW of renewable capacity and 100 GWh a day of storage by FY36. The state expects most of the incremental demand growth over the next decade to be met through renewable procurement, supported by battery and pumped storage and by grid modernisation.

3.2.2. Agriculture demand scenario

Maharashtra's power demand has grown steadily, driven by industrial expansion and agricultural intensification. Agriculture remains a major and structurally important component of the state's electricity demand.

Against a total electricity supply of 166 BU in FY25, agricultural sales alone account for roughly 23% of statewide annual supply, which is the measure of the sector's weight in the demand mix. Agricultural consumption therefore drives DISCOM energy planning, subsidy requirement and feeder-level load management alike.

[17] Maharashtra Renewable Energy & Energy Storage Policy 2025-26 to 2035-36

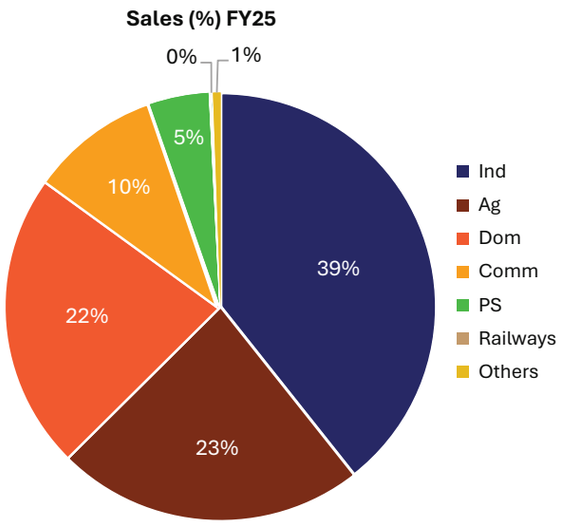


Figure 3.3 Maharashtra, electricity sales by consumer category, FY25

3.2.3. Maharashtra's natural advantage in solar

Maharashtra has a strong natural and geographic advantage for solar energy owing to its large land area, significant wasteland availability, high solar irradiance across several districts and the proximity of many potential sites to roads and substations. That resource advantage is now being converted into a policy one. The Renewable Energy and Energy Storage Policy 2025-26 to 2035-36 carries enabling provisions for solar expansion through land leasing, renewable energy industrial zones, storage-linked solar projects and simplified approvals.

Maharashtra pursued agricultural solarisation with such urgency because a set of compounding, interconnected problems had made the conventional approach unsustainable. A brief snapshot follows.

01 **Structural losses.** MSEDCL's agricultural segment was a structural loss centre. Subsidised tariffs, often zero for small farmers, high unmetered consumption, AT&C losses of 15% to 20% on agricultural feeders and accumulated arrears together posed a financial challenge the utility could not absorb indefinitely.

02 **Cross-subsidy erosion.** Industrial and commercial consumers, who had cross-subsidised agricultural consumers by paying above-cost tariffs, were migrating steadily to open access and captive power. MSEDCL's cross-subsidy revenue base was eroding at precisely the moment agricultural demand was growing.

03 **Farmer discontent.** The rotational night-time supply schedule was causing acute farmer discontent, with Vidarbha and Marathwada worst affected, since unreliable supply bore directly on irrigation reliability and crop yields.

04 **Thermal dependence.** Maharashtra's base load was predominantly coal-based, making its power sector one of the more carbon-intensive in India. With RPO targets and nationally determined contribution (NDC) commitments to meet, agricultural solar offered a large-scale, cost-effective route.



3.3 Agriculture solarisation schemes, the journey

3.3.1 Early grid era, before 2017

Maharashtra's agriculture solarisation journey started around 2015, when the state began implementing solar agricultural pump schemes such as the Atal Solar Agricultural Pump Scheme, targeting farmers in remote areas without grid access. These early pilots established the groundwork, namely farmer familiarity with solar technology, vendor development ecosystem, and government administrative processes for solar pump installation.

The subsequent Mukhyamantri Saur Krushi Pump Yojana (MSKPY) expanded the off-grid model. MSKPY targeted the installation of 100,000 off-grid solar photovoltaic agricultural water-pumping systems. Alongside off-grid pumps installed under other state and central schemes, it demonstrated the technology's viability and laid the foundation for the much larger programmes that followed.

In parallel, the National Solar Mission, launched in 2010, provided the national policy foundation for scaling solar energy, while rapidly falling solar tariffs improved the economic case for larger solar applications. Indian solar tariffs fell steeply after 2010, with reported declines of around 73% by 2017, supported by falling module costs, competitive auctions, and lower financing costs.

The idea that solar could power an entire feeder, and do so at costs below the grid, began to take shape in Maharashtra's energy policy circles, shaped in good part by inputs from the industry.

3.3.2 The pioneer, MSKVY 1.0

3.3.2.1 Adoption phase, 2017 to 2022

The Government of Maharashtra launched the Mukhyamantri Saur Krushi Vahini Yojana (MSKVY) through Government Resolution dated 14 June 2017. It was India's first state-level scheme explicitly targeting the solarisation of agricultural electricity feeders through decentralised distributed solar generation.

Table 3.1 MSKVY 1.0, original design parameters

Objective: Solarise agricultural feeders in rural areas where village and agricultural feeders have been segregated, providing daytime power to farmers at affordable cost

Project size: 2 MW to 10 MW connected at 11 kV

Location: Within a 5 km radius of 11 kV to 132 kV substations, revised to 2 km to 3 km with a 5 km exception by the amendment of March 2018

Implementing agency: Maharashtra State Power Generation Company Limited (MSPGCL) initially, with MSEDCL added by Government Resolution dated 17 March 2018

Land: Government land at a nominal ₹1 a year for 30 years; private land on lease

Procurement: Competitive bidding in PPP mode, with a tariff ceiling of ₹3.30/kWh for the first rounds

PPA duration: 25 years

CUF minimum: 15% per annum

First pilots: Ralegan Siddhi, Ahmednagar district, and Kolambi, Yavatmal district

Source: Government Resolution, 14 June 2017

The March 2018 amendment was a critical early course correction, driven by practical difficulties encountered during pilot implementation. It added MSEDCL alongside MSPGCL as an implementing agency, recognising that the distribution company, which owned and operated the sub-stations, was the natural implementing entity. It also issued guidance on competitive bidding processes, payment mechanisms, and metering arrangements.

Between 2017 and 2023, MSKVY 1.0 progressed through several tender rounds. Under the scheme, MSEDCL signed power purchase agreements for 1,531 MW, of which 634 MW has been commissioned. In consequence, 147,759 agricultural consumers on 377 agricultural feeders across 96 substations now receive eight-hour three-phase daytime power supply.

That was a significant achievement for India's first feeder solarisation programme, and it still fell well short of the original ambition. The gap between what was tendered and what was commissioned revealed deep structural implementation challenges.

3.3.2.2 The reckoning, challenges analysed

An honest accounting of MSKVY 1.0's challenges is essential, because these failures directly shaped the far more successful MSKVY 2.0 design. In 2022, the Government of Maharashtra undertook a comprehensive stakeholder consultation exercise, including meetings with developers, MSEDCL field teams, district collectors, MEDA, MNRE and others to understand what had gone wrong.

The consultation, led by the Principal Secretary (Energy), identified the following structural problems:

Table 3.2 MSKVY 1.0, identified failure modes

Technical challenges

- Grid connectivity at 11 kV and 22 kV was inadequate at many target substations.
- Equipment deficiencies, poor maintenance and unbalanced loads made solar injection difficult.
- Developers arrived at substations that were not ready to receive their power.

Economic challenges

- Small project sizes of 2 MW to 10 MW spread fixed development costs over fewer megawatts, leaving the economics marginal in the early years.
- Unexpected costs, site-specific land issues, connectivity charges and delays eroded financial viability.
- Larger developers with better access to capital stayed away from projects of that size.

Procedural and regulatory challenges

- Land availability near substations was the single biggest constraint.
- Sequential government approvals for land conversion, revenue clearance, forest NOC, gram panchayat NOC and the electrical inspector each took months, with no single window.
- Delays cascaded, and one pending NOC held up an entire project.

Non-agricultural permission and tax exemption left unimplemented

- The Government Resolution of 2017 provided that land for solar agricultural feeders need not be converted to non-agricultural use and exempted solar projects from revenue and local body taxes.
- District-level implementation was uneven.
- Developers continued to face demands for non-agricultural conversion and tax payments, which defeated the safeguard.

Payment risk. Developer doubts about MSEDCL's payment reliability, set against the utility's financial position, deterred quality bidders and pushed up risk premiums in tariff bids.

Source: MSKVY 2.0 Government Resolution preamble, 8 May 2023

3.3.3. The national framework arrives, PM-KUSUM 2019 to 2021

As MSKVY 1.0 was grappling with its implementation challenges, the Government of India launched PM-KUSUM in February 2019, providing a national framework, Central Financial Assistance (CFA), and policy legitimacy for large-scale agricultural solarisation. Maharashtra's MSKVY was explicitly aligned with PM-KUSUM Component C, covering grid-connected pump solarisation and feeder level solarisation.

The Government of Maharashtra issued Government Resolution dated 12 May 2021, to formally adopt and implement all three PM-KUSUM components in the state. The resolution made the institutional assignments set out below.

Component A covering decentralised grid-connected solar plants of **0.5 MW to 2 MW.** MSEDCL is the implementing agency, with a target of **5,000 MW over five years,** CFA of **₹6.6 lakh per MW** a year or **₹0.40** a unit for the first five years, and a **maximum tariff of ₹3.30/kWh.**

Component B, covering off-grid solar pumps. The Maharashtra Energy Development Agency (MEDA) is the implementing agency, with **100,000 pumps under PM-KUSUM plus additional state scheme pumps,** and CFA of **30% from the Government of India.**

Component C, covering grid-connected pump solarisation. MSEDCL is the implementing agency, with an **initial target of 50,000 pumps.**

3.4 MSKVY 2.0

3.4.1 The beginning

By early 2023, six years of evidence from MSKVY 1.0 had accumulated, the PM-KUSUM framework was widening, and solar costs were falling sharply. Together these created the conditions for a fundamental redesign. The Government of Maharashtra, under Deputy Chief Minister and Energy Minister Devendra Fadnavis, engaged in an intensive six-month redesign exercise with all major stakeholders.

On 24 April 2023, Deputy Chief Minister Fadnavis formally launched MSKVY 2.0 and Mission 2025 in Mumbai. The formal Government Resolution followed on 8 May 2023. The redesign was a comprehensive overhaul, addressing every identified failure mode of MSKVY 1.0.

By Government Resolution dated 13 September 2024, the target was raised from 7,000 MW to 16,000 MW, reflecting the extraordinary developer response.

The journey from MSKVY 1.0 to 2.0 stands as one of the clearest examples in India's renewable energy sector of institutional learning converting obstacles into progress.

3.4.2 MSAPL's role as nodal agency

To ensure focused execution, the Government of Maharashtra established a dedicated entity, MSEB Solar Agro Power Limited (MSAPL), under MSEB Holding Company. Alongside it came the formation of 22 special purpose vehicles (SPVs), each responsible for executing solar projects in designated clusters. These SPVs were designed to aggregate land, manage approvals and support project development, reducing administrative burden and enabling scale.

3.4.3 Alignment with PM-KUSUM 2019

A critical distinction in Maharashtra's solarisation story is the interplay between state-level schemes and central government schemes. Maharashtra implemented PM-KUSUM and, alongside it, designed state-level innovations that went beyond the national framework and, in several cases, were subsequently incorporated into PM-KUSUM guidelines.

Table 3.3 Maharashtra state scheme and PM-KUSUM compared, by design aspect

Aspect	State scheme (Maharashtra)	Central scheme (PM-KUSUM)
Primary vehicle	MSKVY 2.0, the Mukhyamantri Saur Krushi Vahini Yojana 2.0	PM-KUSUM Components A, B and C
Project size flexibility	0.5 MW to 25 MW, at any cluster size	0.5 MW to 2 MW under Component A, with no strict cap for FLS
Tariff incentive	▸ ₹0.25/kWh at 11 kV and 22 kV, for three years ▸ ₹0.15/kWh at 33 kV, for three years	CFA of ₹1.05 crore per MW, passed through as a tariff rebate
Payment security	₹700 crore revolving fund, created by the state	None
Land pre-clearance	▸ Advanced by the state government through a 45-day campaign ▸ SPV model	▸ Guidance only ▸ Arrangements made by the states
Gram panchayat community grant	₹5 lakh per gram panchayat a year, for three years	None
Substation grant	₹25 lakh per substation, from the Green Cess Fund	None
Nodal agency	MSAPL, a dedicated subsidiary created by the state	State nodal agency, MEDA and MSEDCL
Digital portal	▸ MSKVY 2.0 PMU portal, built by MSAPL and MSEDCL IT ▸ Heavily customised	PM-KUSUM national portal
Regulatory recognition	MERC approved all deviations explicitly	PM-KUSUM norms are mandatory

The state's innovations sit on top of the central framework, making the relationship an additive one. MNRE formally recognised several MSKVY 2.0 innovations in its July 2023 amendment to PM-KUSUM guidelines. The pre-clearance model, payment security fund concept, and community benefit grants were incorporated as recommended practices for all states.

3.4.4 Progress

The tender process has so far covered 15,714 MW of capacity, of which work orders have been issued for 15,404 MW and power purchase agreements signed. As of 17 June 2026, 969 solar projects totalling 4,637.6 MW have been commissioned, serving 1,266,453 agricultural consumers on feeders within the relevant substations.

The Central Government approved works worth ₹2,978 crore (about ₹30 billion) under the Revamped Distribution Sector Scheme (RDSS) for strengthening the distribution system connected to Mukhyamantri Saur Krushi Vahini feeders, at the Monitoring Committee meeting held on 21 June 2024. Progress as of May 2026 is set out in Table 3.4.

Table 3.4 Distribution strengthening works approved under RDSS, status as of May 2026						
Sl.	Work description	Sanctioned	As of May 2026			
			Target	Achieved	In progress	Achieved (%)
1	New substations	153	151	17	86	11
2	Additional power transformers in substations	167	181	84	77	46
3	Substation transformer capacity addition	253	252	196	21	78
4	New 33/22 kV HV feeders (km)	3,244	2,880	497	370	17
5	33 kV feeder strengthening (km)	1,122	460	0	0	0
6	New 11 kV HV feeders (km)	9,691	6,311	1,337	759	20

3.4.5 Key features

MSEDCL's vision for MSKVY 2.0 rests on structural transformation. The scheme has been designed to do four things.

- Reconfigure energy delivery at the feeder level
- Build localised and resilient renewable ecosystems
- Strengthen the economic and operational viability of the utility
- Deliver high-quality, consumer-centric services to farmers

Taken together, these commit MSEDCL to becoming a financially sound and sustainability-led distribution company, and to reshaping how agricultural power is supplied in India.

The scheme marks a significant evolution in agricultural feeder solarisation, moving beyond conventional renewable energy deployment towards a comprehensive rural power sector reform programme. It increases renewable energy penetration and addresses long-standing challenges in agricultural power supply, subsidy burden, land acquisition and distribution system efficiency.

Large-scale decentralised agricultural feeder solarisation

Where conventional utility-scale solar sits far from load centres, MSKVY 2.0 adopts a distributed generation architecture, placing solar power plants close to agricultural substations and feeders. Generation then aligns directly with local agricultural demand, reducing transmission losses, improving voltage profiles and cutting dependence on long-distance power procurement. It is one of the largest decentralised feeder-level solarisation programmes globally, targeting around 16 GW of solar capacity across rural Maharashtra.

Structural shift from night-time to assured daytime power supply

The transforms the agricultural power supply model, enabling reliable daytime electricity for irrigation. Historically, agricultural consumers have depended on night-time supply because of system constraints and cost considerations. By matching solar generation with daytime agricultural demand, MSKVY 2.0 answers a long-standing operational challenge faced by farmers. The design follows the agricultural load curve rather the generation profile alone, which makes it a consumer-centric reform as much as a renewable energy initiative.

Integration of distribution sector reform with renewable energy development

The scheme functions as a distribution utility efficiency programme. Replacing higher-cost conventional power procurement with localised solar energy delivers four gains.

- Lower power purchase costs
- Lower technical losses
- Improved feeder reliability
- A smaller agricultural subsidy requirements over the long term

It therefore addresses renewable energy targets, DISCOM financial sustainability, and farmer service quality within a single intervention framework.

Innovative land aggregation and monetisation framework

Recognising land availability as a major bottleneck in decentralised solar deployment, MSKVY 2.0 introduces a flexible land sourcing approach drawing on four sources.

- Private agricultural land
- Government revenue land
- Community-owned land
- Hybrid land aggregation models

The scheme further institutionalises land leasing mechanisms that create predictable income streams for rural stakeholders without calling for permanent land acquisition.

Underutilised rural land becomes a long-term income-generating asset while avoiding the social challenges typically associated with large-scale land acquisition.

Convergence with national renewable energy programmes

MSKVY 2.0 has been structured to work with the Government of India's PM-KUSUM programme, optimising central financial assistance and aligning with national agricultural solarisation objectives. The result is a coordinated state and centre implementation framework that improves financial viability while accelerating deployment.

3.4.6 Innovation in design

3.4.6.1 Land and project structuring

A major bottleneck in the implementation of solar projects in rural India is the availability and aggregation of land. MSKVY 2.0 tackled this through a multi-layered strategy that combined spatial planning, institutional innovation, and community engagement. The programme recognised that land acquisition delays, fragmented ownership, and lack of infrastructure near substations were key barriers to scaling decentralised solar generation. To address these, the Government of Maharashtra and MSEDCL introduced reforms and mechanisms that streamlined land identification, ensured fair compensation, and created robust institutional frameworks for project execution. These accelerated deployment and secured inclusivity, transparency and long-term sustainability.

1. Identification of substations

Substations with downstream agricultural load were selected against the following criteria.

- 33/11 kV substations carrying agricultural consumption load of 0.5 MW to 5 MW. These projects were planned preferably within a 5-km radius.
- 132/33 kV substations carrying agricultural consumption load of 5 MW to 25 MW, either directly or through downstream 33/11 kV substations. These projects were planned preferably within a 10-km radius.
- Substations with no space for bay on the LV side were included only where additional land was available.

For a faster rollout of MSKVY 2.0, preference went to substations with higher availability of LV busbar, power transformer and HV side systems.

2. Sizing of capacity at substations

The capacity of solar projects developed under each substation was determined by the agricultural energy requirement served by that substation. The sizing methodology ran as follows.

- **For agricultural feeders:** The annual energy requirement for agricultural use was taken from the meters installed at the substation for the segregated agricultural feeders
- **For mixed feeders:** Since mixed feeders carry both agricultural and non-agricultural loads, the agricultural energy requirement was estimated on an allocation basis.
  - The ratio of annual energy consumption to connected HP load was determined for all segregated agricultural feeders, taken together, at the respective substation.
  - This ratio was then applied to the HP load connected on mixed feeders to estimate the corresponding agricultural energy requirement on such mixed feeders.
- Total agricultural energy requireme nt was taken as the sum of two figures.
  - Annual energy requirement of segregated agricultural feeders.
  - Estimated agricultural energy requirement on mixed feeders.
- A capacity utilisation factor (CUF) of 19% was used to convert the annual energy required for agricultural use in kWh into the required solar capacity in MW.
- Under normal operating conditions, the transformation capacity at the substation does not act as a constraint on solar capacity addition. The maximum solar PV capacity installable at a given substation was held to two ceilings.

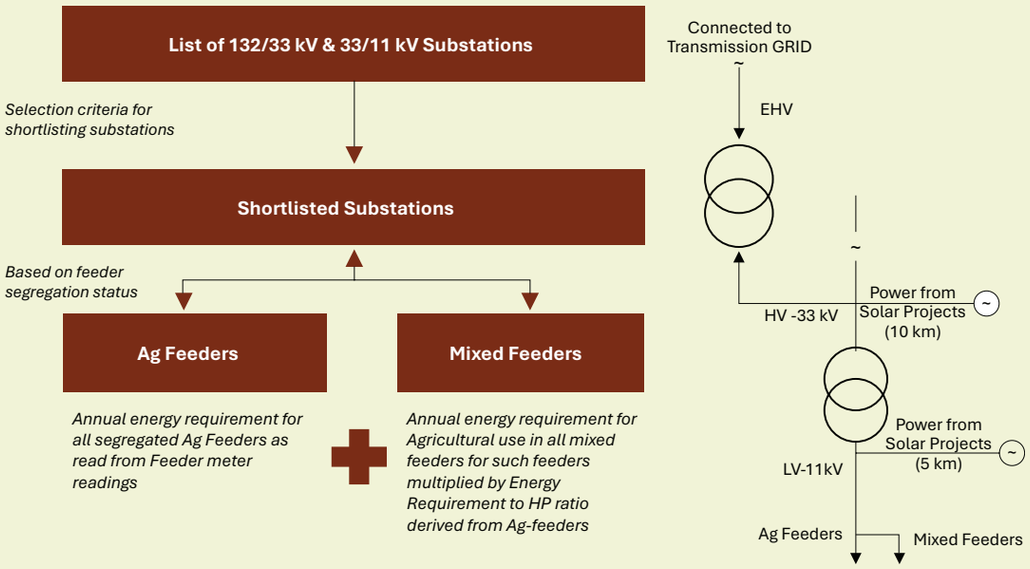


Figure 3.5 Solar PV capacity allocation methodology at substation level

- The aggregate solar PV capacity installed at any substation under MSKVY 2.0 shall not exceed the rated capacity of the power transformer at the concerned substation.
- In cases where solar power is injected at the LV side of a 132/33 kV substation and such injection results in power flow towards downstream 33/11 kV substations, the power transformer capacity at the downstream 11 kV substation would also be assessed to identify any potential constraint.

Solar PV Capacity allocation runs bottom-up from 11kV to 33kV level, after netting off the capacity already awarded. Solar PV MW capacity at 33kV LV side of 132/33 kV substation accounts for downstream energy required for all direct feeders serving Ag load as well as those from downstream 33/11kV substations. The residual capacity would be added for solarisation at the 33kV LV side of parent 132/33kV substation.

The objective of this sizing methodology is to ensure that enough solar energy is produced to meet the annual supply requirement for agricultural consumption. The approach also reduces loading on the 132 kV line, the 33 kV line and the power transformers in 132/33 kV and 33/11 kV substations.

3. GIS-based land identification and mapping

MSKVY 2.0 used geospatial technology to identify and map over 40,000 acres of government and private land parcels within a 5–10 km radius of 33/11 kV substations. Using platforms like the **PM Gati Shakti Portal, Mahabhulekh,** and Maharashtra Remote Sensing Application Centre (MRSAC), land parcels were geo-tagged and layered with substation data, solar irradiation maps, and infrastructure overlays. This enabled developers to assess feasibility, proximity to grid infrastructure, and environmental constraints. The data was housed in a centralised Land Bank Portal and integrated into the MSKVY 2.0 dashboard, providing real-time visibility and reducing acquisition delays. Land identification was therefore fast, transparent and data-driven.

4. Data room and land portal integration

A dedicated Data Room was created to provide developers with comprehensive information on land parcels and substations. It carried GIS-layered maps, land parcel coordinates, solar resource data (irradiation maps), transmission line overlays, and details of grid connectivity. The portal also included polygonal coordinates, land ownership records, downstream agricultural load data, installed capacity and spare bay availability at substations. Both revenue and private lands were included, and access was granted on a limited basis to ensure data security. The integration of this Data Room with the MSKVY 2.0 dashboard enabled real-time updates and supported informed bidding decisions while reducing the risk of project delays from missing or inaccurate data. This transparency was a key factor in attracting high-quality developers and achieving competitive tariffs.

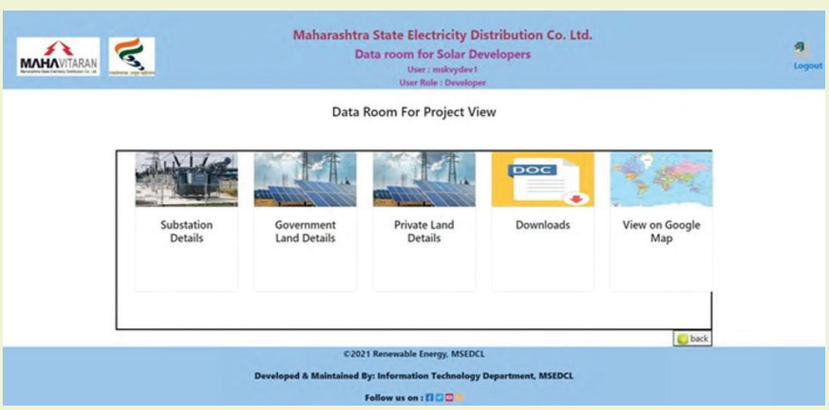


Figure 3.6 MSKVY 2.0 Data Room, project view for developers

5. Fixed lease rent model for private land-owners

To encourage landowners to participate voluntarily, MSKVY 2.0 introduced a standardised lease rent model of ₹1.25 lakh per hectare annually, with a 3% annual escalation. Gram Panchayats hosting solar projects received ₹5 lakh a year for three years as a Social Development Grant. These incentives secured local support, reduced resistance and promoted community ownership. By formalising lease terms and integrating them into the bidding framework, MSEDCL ensured that developers could secure land without prolonged negotiations or legal disputes. Land portal was developed for farmers to register and update details of their land for developers to access.

6. District-level SPVs for project aggregation

To streamline project execution and reduce administrative burden, the Government of Maharashtra established the MSAPL and 22 district-level special purpose vehicles (SPVs). These entities are responsible for aggregating land, securing clearances, and managing project development. Revenue land was housed under SPVs, and successful bidders were required to take over them through share sale and purchase agreements (SSPA). This 'plug-and-play' model allowed developers to bypass early-stage risks and focus on execution. The SPVs also handled lease agreements, performance guarantees, and compliance tracking, making the entire process efficient and scalable.

3.4.6.2 Regulatory enablement and fast-track approvals

One of the most significant barriers to solar project deployment in India has been the procedural complexity and slow pace of regulatory approvals. MSKVY 2.0 tackled this by simplifying, digitising and accelerating the approval process. These reforms reduced developer risk, improved transparency and secured timely commissioning. The result was a streamlined system in which land, grid connectivity and statutory clearances were made available upfront, letting developers concentrate on execution rather than compliance.

1. Single-window clearance mechanism

MSKVY 2.0 introduced a Single Window Portal (SWP) to consolidate all regulatory approvals, ranging from land use permissions and environmental clearances to grid connectivity and NoCs. This portal was integrated with the MSKVY 2.0 dashboard and provided real-time tracking of application status, flagging delays and enabling escalation. It allowed developers to submit applications, receive updates, and access a dedicated dashboard for monitoring progress. The mechanism cut approval timelines and improved coordination among agencies such as MEDA, the Chief Electrical Inspector (CEI) and MSETCL.

2. Pre-approved grid connectivity and no objection certificates

To eliminate delays in grid integration, MSKVY 2.0 undertook advance technical feasibility studies and issued grid connectivity permissions before tendering. These clearances were mapped to substations and land parcels and made available in the data room for developers. Developers could therefore begin work immediately on receiving the letter of award (LoA), without waiting for post-award approvals. The approach also improved the bankability of projects by reducing regulatory uncertainty and enabling faster financial closure.

3.4.6.3 Financial structuring and incentive framework

To ensure the financial viability and scalability of MSKVY 2.0, the Government of Maharashtra and MSEDCL designed a comprehensive financial architecture that addressed developer risk, reduced power procurement costs, and rewarded early execution. The scheme's financial model rested on competitive bidding, central and state-level subsidies, payment security mechanisms and community-centric incentives. These measures attracted high-quality developers and ensured that the benefits of solarisation were distributed equitably across stakeholders, from farmers and Gram Panchayats to the utility and the state government.

1. Competitive bidding and tariff discovery

MSKVY 2.0 adopted a transparent e-bidding process to allocate solar projects. Developers bid for clusters of 200 MW to 250 MW, enabling economies of scale and attracting experienced players. The bidding process was completed in 10 months, and tariffs discovered ranged from ₹2.69/kWh to ₹3.10/kWh, with a weighted average of ₹3.06/kWh for 9,154 MW. A further round of open tendering covered 6,250 MW. These tariffs sit well below conventional power procurement costs, helping MSEDCL reduce its annual power purchase expenditure by ₹10,000 crore (about ₹100 billion). Competition delivered cost-effectiveness while quality and compliance standards held.

2. Central financial assistance under PM-KUSUM Component C

To further reduce the cost of solar power and improve project bankability, MSKVY 2.0 projects were tagged with PM-KUSUM Component C, making them eligible for CFA of ₹1.05 crore per MW. The subsidy lowers the capital cost for developers and lets them offer competitive tariffs. Tagging was done at substation level, based on agricultural load and project sizing, aligning the scheme with national renewable energy goals and simplifying approval. Integration with the PM-KUSUM guidelines meant projects met national standards and drew central subsidies without additional paperwork, and it also sped up tariff adoption by MERC and sharpened the competitiveness of bids.

3. Revolving payment security fund

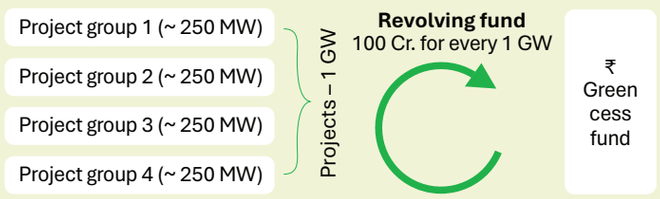


Figure 3.7 Revolving payment security fund, structure and flow

To mitigate payment delays and build developer confidence, a **Revolving Payment Security Fund** of **₹100 crore per 1,000 MW** was created from the **Green Cess Fund.** This fund acts as a credit guarantee, ensuring that developers receive timely payments even if MSEDCL delays disbursements beyond three months. The nodal agency is responsible for managing the fund and receives a 1% administrative fee for its services. Any amount paid from the fund is offset against the subsidy payout from the Government of Maharashtra to MSEDCL, maintaining fiscal discipline and liquidity.

4. Incentives for early commissioning

To accelerate project execution and reward efficiency, MSKVY 2.0 introduced production- linked incentives for early commissioning.

- **₹0.25/unit** for injection at 11 kV
- **₹0.15/unit** for injection at 33 kV

These incentives apply for the first three years after commissioning and are funded by the state. They push developers to build faster, and they bring the benefits to farmers and the grid sooner.

5. Incentives for community participants

To build local support and ensure inclusive development, MSKVY 2.0 provides two grants.

- **₹5 lakh/year** for 3 years as a **Social Development Grant** to Gram Panchayats hosting solar projects
- **₹25 lakh as** one-time grant for system strengthening at substations

These grants promote community ownership, improve infrastructure readiness, and reduce resistance to land leasing. The socio-economic benefits therefore reach beyond energy access into rural development and employment.

3.4.6.4 Infrastructure and grid modernisation

The integration of 16 GW of decentralised solar capacity into Maharashtra's agricultural grid required a parallel transformation of the state's distribution infrastructure. MSKVY 2.0 was a grid modernisation mission as much as a solar deployment programme, aimed at enabling reliable daytime supply, reducing technical losses and widening real-time visibility across thousands of substations and feeders. Three initiatives carried this work.

1. Feeder segregation for daytime agricultural supply

Feeder segregation was a cornerstone of MSKVY 2.0's strategy to deliver dedicated daytime electricity to agricultural consumers. Separating agricultural load from residential and commercial demand allowed for targeted solarisation and improved load management. Segregated feeders were mapped to substations and tagged for solar capacity allocation, so that solar plants could be sized and dispatched to match. The work improved supply reliability, cut technical losses and strengthened billing efficiency.

2. SCADA and centralised monitoring infrastructure

To enable real-time performance tracking and operational transparency, MSKVY 2.0 integrated solar projects with MSEDCL's centralised SCADA system. The system carries monitoring of solar generation and substation-level performance across the state. SCADA integration forms part of a broader digital infrastructure that includes a Centralised Command and Control Centre, which aggregates data from substations and solar plants.

3. Storage systems for grid stability

A sharp rise in intermittent generation puts grid stability under strain. A load-flow analysis was carried out, and a plan drawn up to develop decentralised storage systems co-located with the MSKVY plants.

MSEDCL floated a tender for procurement of a 750 MW/1500 MWh battery energy storage portfolio on a long-term basis. The procurement framework was aligned with the Ministry of Power's 2022 guidelines on the use of battery energy storage systems across generation, transmission, and distribution segments, positioning the deployed storage as an integral component of the power system. The BESS portfolio is spread across around 75 substations, with each site expected to host an approximately 10 MW battery system, together providing 750 MW of storage capacity. These batteries are broadly matched with nearby MSKVY solar projects of about 9 MW to 25 MW, which indicates a co-located, feeder-level solar-plus-storage design. Each BESS connects at the 33/11 kV substation level through a defined delivery and interconnection point, confirming that the systems operate within the distribution grid and directly manage local feeder-level power flows.

From a systems perspective, the integrated deployment of distributed solar and storage turns each participating substation into a localised energy hub capable of both generation and flexibility services.

3.4.6.5 Digital and consumer-centric innovations

MSKVY 2.0 has been designed with a strong emphasis on digital transformation to ensure transparency, efficiency, and ease of access for all stakeholders involved in the solarisation of agricultural feeders. The programme integrates advanced IT tools and platforms to streamline project execution, deepen consumer engagement and simplify regulatory processes. These innovations have accelerated implementation timelines and improved service delivery across Maharashtra's rural energy landscape.

1. Digital portal for developer lifecycle management

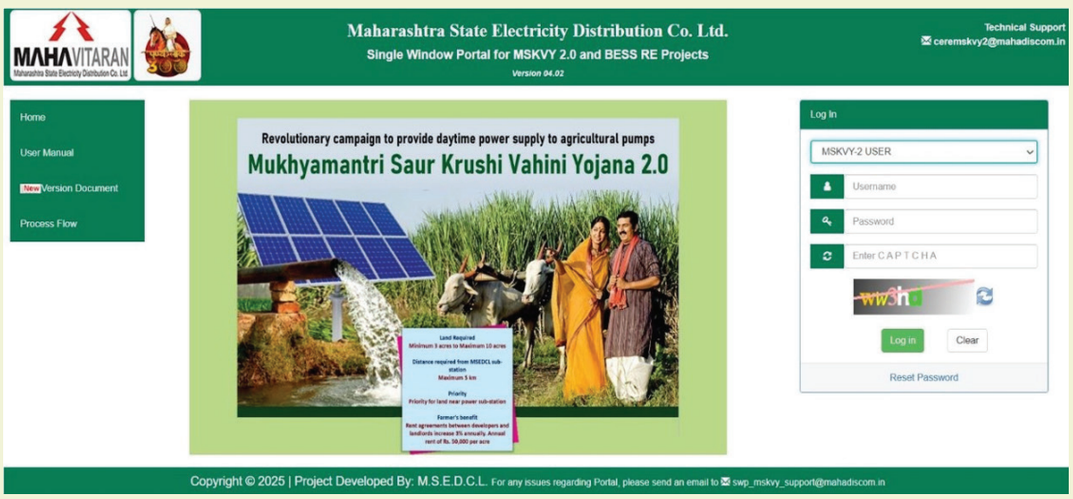


Figure 3.8 MSKVY 2.0 single window portal, developer interface

The MSKVY 2.0 portal is a comprehensive digital platform that manages the entire lifecycle of solar project development. It includes modules for the aspects shown below.



Figure 3.9 Documents and clearances automated on the MSKVY 2.0 portal

Developers benefit from automated generation and digital signing of key documents such as Letters of Awards (LoAs), Power Purchase Agreements (PPAs), and Share Sale and Purchase Agreements (SSPAs), which are dispatched automatically through integrated APIs. The portal also supports real-time tracking of project milestones and regulatory clearances, improving transparency and reducing administrative delays.

2. Aadhaar-based OTP authentication for service access

MSKVY 2.0 uses Aadhaar-based OTP authentication to streamline service access and ensure secure verification of stakeholders. It serves for onboarding land-owners, validating lease agreements, and authenticating beneficiaries. By linking services to Aadhaar, the programme ensures transparency, reduces fraud, and simplifies documentation. It also speeds faster approvals and strengthens the credibility of transactions, particularly in land leasing and subsidy disbursement.

3.4.6.6 Smart operations and forecasting

To manage the complexities of integrating 16 GW of decentralised solar capacity into Maharashtra's agricultural grid, MSKVY 2.0 adopted a data-driven and technology-enabled approach to operations and forecasting. These innovations aimed at improving grid reliability, optimising solar dispatch and securing timely execution of projects. The scheme's operational strategy rested on predictive analytics, milestone-based monitoring and digital dashboards that gave real-time visibility across thousands of substations and feeders.

1. Load forecasting and consumption-based sizing

MSKVY 2.0 uses forecasting techniques to align solar generation with agricultural demand. Project sizing runs bottom-up from consumption at substation level, analysing downstream agricultural load so that generation matches actual consumption patterns. The use of geo-tagged substations, GIS-layered data and real-time dashboards supports predictive planning and load balancing, which are foundational elements of smart grid operations.

2. Milestone-based execution and monitoring

MSKVY 2.0 employs a robust milestone-based framework to ensure timely and transparent execution of solar projects. A centralised digital dashboard tracks progress from LoA issuance to commissioning, with modules for substation strengthening, SPV operationalisation, and CFA milestone compliance. Field-level data is captured via mobile applications, enabling real-time updates and alerts across MSEDCL's operational hierarchy.

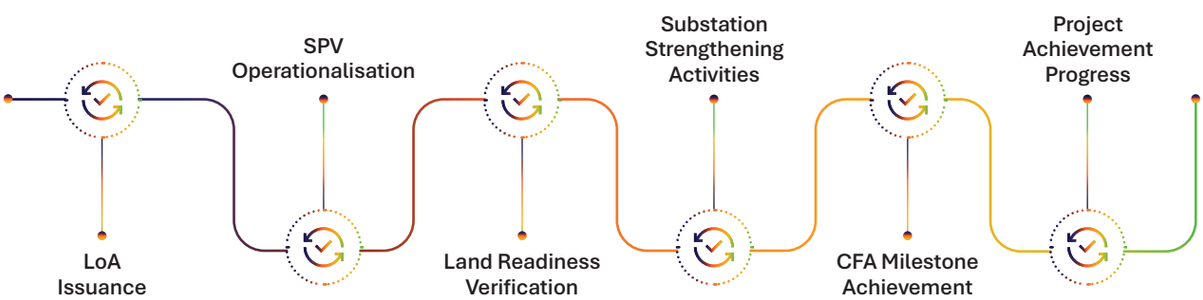
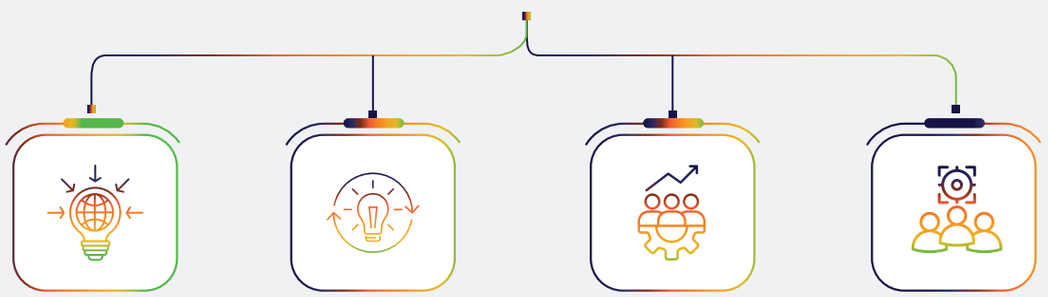


Figure 3.10 Milestone-based execution and monitoring framework under MSKVY 2.0

Each milestone such as land readiness, grid connectivity, and PPA signing is digitally monitored, allowing for proactive issue resolution and performance tracking. The framework has accelerated award and commissioning timelines, and it secures accountability, reduces delays and supports data-driven decision-making across all implementation stages.

3.4.6.7 Infrastructure readiness and skill development

Distributed renewable energy projects create far more jobs per MW than large-scale projects. Construction and commissioning offer the highest employment potential, at about 20 skilled and semi-skilled workers per MW, while operations and maintenance require roughly two per MW. As project size increases, the skilled-per-MW ratio rises modestly, particularly during construction and commissioning, while the proportion of unskilled labour grows more sharply. To build the local skilled workforce that project developers need, the Maharashtra Saurya Kaushal Yojana (Maha-SKY) was launched by the Energy Department, Government of Maharashtra, and MSEDCL. The programme is supported by the Asian Development Bank (ADB) and was designed with technical assistance from the Global Energy Alliance for People and Planet (GEAPP). ADB has set a target of training 5,000 local people, with at least 30% women and youth. The strategy is set out in Figure 3.11.



INITIATIVE INSTITUTIONALIZING

- Maha-SKY can emerge into a major skill development program of GoM catering to the manpower needs of not only MSKVY 2.0 but also other solar initiatives of the Government and private sector
- Emphasis on spawning local entrepreneurs
- ADB developing a detailed action plan for anchoring the initiative with relevant GoM departments like **Skill Development, Employment, Entrepreneurship and Innovation (Maha-SWAYAM)**

PHASE-WISE IMPLEMENTATION

- Pilot program targeting **100 participants** for finalizing training modules content & approach
  - **1st training session:** 18th–23rd June 2025, **57 female participants**
  - **2nd training session:** 18th–24th August 2025, **43 male participants**
- **1st phase of 900 participants** would follow the pilot program with the remaining **4,000** would be covered by MSEDCL
- Overall employment generation potential in the above five districts is around **4,000**

COLLABORATION FOR CAPACITY BUILDING

- **Skill Council for Green Jobs (SCGJ)** identified as the agency to design and implement the capacity building initiative
- SCGJ, under the **Ministry of Skill Development and Entrepreneurship (MSDE),** is active in the domain of capacity building for green businesses

TRAINING FOCUS

- Focus of the training content would be **O&M of the solar plants**
- Emphasis on proper electrical connectivity, quality craftsmanship, compliance with all applicable codes, standards and safety requirements
- The training module approved/in consonance with the **National Skills Qualifications Framework (NSQF)** of the **National Skill Development Corporation (NSDC)**

Figure 3.11 Maharashtra Saurya Kaushal Yojana, skilling framework and phasing



Image 3.1 First Maha-SKY training session for women participants, inaugurated by the CMD, MSEDCL, at the Nashik Training Centre, 18 June 2025

3.4.7 Institutional framework

3.4.7.1 Overview of the institutional framework

One of the key learnings from MSKVY 1.0 was how far diffused accountability set back implementation. With responsibilities distributed across MSPGCL, MSEDCL and MEDA, and no single agency designated as the accountable entity, ownership of outcomes remained fragmented. Coordination suffered, and no institution carried clear end-to-end responsibility for driving implementation.

MSKVY 2.0 addresses this gap through a more clearly defined institutional framework, with specific roles, responsibilities, and accountability mechanisms assigned across stakeholders. The structure gives stronger ownership, improved coordination, faster decision-making and more effective programme execution.



Table 3.5 Institutional roles and responsibilities under MSKVY 2.0		
Institution	**Role in MSKVY 2.0**	**Key responsibilities**
Government of Maharashtra, Energy Department	Policy maker and funder	Government Resolutions, target setting, financial approvals, inter-departmental coordination and chairmanship of the state-level committee
MSAPL, MSEB Solar Agro Power Limited	Nodal agency	Tendering, award, land management portal, SPV operationalisation, revolving fund, single window approvals, project monitoring and developer support
MSEDCL	Implementation and offtake	Grid connectivity, substation upgrades, metering, billing, payment to developers, SCADA integration and generation monitoring
MEDA	Quality, compliance and CFA	PM-KUSUM portal registration, CFA processing, quality checks, and state nodal agency for Component B off-grid pumps
MSETCL	Transmission interface	Concurrence for 33 kV connections, grid stability studies and transmission NOC
MERC	Regulator	Tariff adoption, standard bidding document approval, RPO compliance and regulatory orders
District Collectors	Land and local governance	Government land identification and transfer, facilitation of local NOCs and Gram Panchayat coordination
Standing Committee, led by the Chief Secretary	Governance oversight	Monthly review meetings, inter-departmental problem resolution and milestone tracking

3.4.7.2 MSAPL, Maharashtra's institutional innovation

MSEB Solar Agro Power Limited (MSAPL), a subsidiary of MSEB Holding Company, was established as the dedicated nodal agency for MSKVY 2.0. It is India's first dedicated solar-agricultural-power entity at the sub-national level. MSAPL combines the commercial instincts of a private entity with the mandate and reach of a state utility, which places it well to bridge the government and developer interface.

The April 2026 decision by the Government of Maharashtra to formally bifurcate MSEDCL and establish MSAPL as a standalone agricultural electricity distribution company with an initial capital infusion of ₹2,500 crore (about ₹25 billion), takes MSAPL from programme manager to full DISCOM for agricultural consumers. No other state has restructured agricultural distribution on this basis.

3.4.7.3 MEDA's role as state nodal agency

Maharashtra Energy Development Agency (MEDA), established under the Maharashtra Energy Development Agency Act 1998, is the designated State Nodal Agency under PM-KUSUM. In the agricultural solarisation framework, MEDA carries four roles.

- MSKVY 2.0 feeder level solarisation. Quality and compliance monitoring; project registration, PM-KUSUM CFA claim processing, IT dashboard operations for performance tracking; capacity building.
- PM-KUSUM Component B. Principal implementing agency for MEDA's own off-grid pump targets under PM-KUSUM, coordination with district administrations.
- MTSKPY. Principal implementing agency for Magel Tyala Saur Krushi Pump Yojana (Maharashtra's own off-grid solar pump scheme).
- Regulatory interface. MEDA is the first-level regulatory compliance entity for PM-KUSUM, processing CFA claims and submitting utilisation certificates to MNRE.

3.4.8 Financial implications

The analysis sets direct fiscal support by the Government of Maharashtra against the direct fiscal revenue benefits expected to accrue to it. Table 3.6 gives the lifecycle assessment of the initial approved budgetary provision and the estimated benefits.

Table 3.6 MSKVY 2.0, indicative cost, revenue and budgetary provision

All figures in ₹ crore

Particulars	Cost	Revenue	Remarks
Cost of incentives			
Early commissioning generation incentive	682	–	₹0.15/kWh for energy injected at the 33 kV busbar and ₹0.25/kWh at 11 kV, for three years
System strengthening grant	351	–	₹25 lakh per substation
Gram Panchayat social benefit grant	211	–	₹5 lakh per project a year, for three years
Revolving payment security fund	700	–	₹100 crore per 1,000 MW of commissioned projects, from the Green Cess Fund
Initial budgetary provision	**1,970**	**–**	
Benefits to the Government of Maharashtra			
GST revenue on capital expenditure and O&M	–	2,478	The O&M share is taken across 25 years of operation
Total benefits	**–**	**2,478**	

Source: MSKVY 2.0 Scheme Document

The scheme therefore presents a strong fiscal and strategic case for the Government of Maharashtra. The direct financial benefits exceed the fiscal burden, creating wider value for MSEDCL and other stakeholders.

3.4.9 Social impact

3.4.9.1 Socio-economic impacts

The analysis sets direct fiscal support by the Government of Maharashtra against the direct fiscal revenue benefits expected to accrue to it. Table 3.6 gives the lifecycle assessment of the initial approved budgetary provision and the estimated benefits.

Farmer welfare and livelihood improvement

- Reliable daytime power supply to 4.5 million farmers, improving irrigation planning, safety, and productivity.
- An end to dependence on night-time electricity, reducing risks for women and elderly farmers.

Additional income for rural households

- Farmers earn ₹1.25 lakh per hectare/year (with 3% escalation) through land leasing for solar projects.
- Stable non-agricultural income reduces overall income volatility.

Employment generation and skill development

- Around 70,000 jobs created, mostly in rural areas.
- Skill-building through Maha-SKY, targeting around 5,000 trained youth with at least 30% women.

Rural economic development

- Gram Panchayats receive ₹5 lakh/year for 3 years (social development grants).
- Regional economic growth and infrastructure improvement.
- Over 2 million women have benefited to date.

Environmental and social sustainability

- Avoids around 5.6 million tonnes of CO_2 emissions annually.
- Supports India's 50% non-fossil capacity target by 2030 with
- Direct contribution to SDG 7 – Affordable and Clean Energy
- Direct contribution to SDG 13 – Climate Action
- Indirect contribution to SDG 2 – Zero Hunger

3.4.9.2 Financial impacts

Reduction in cross-subsidy burden

- Estimated reduction of around ₹13,500 crore in annual cross subsidy burden for industrial and commercial consumers.
- Improves competitiveness of industries by lowering power tariffs.

Government subsidy savings

- Estimated reduction of around ₹54,500 crore in subsidy burden till 2030.
- Stronger long-term fiscal sustainability for the state.

Utility financial health

- A reduction of around ₹10,000 crore a year in power procurement costs.
- A contribution to the reduction in AT&C losses from 19.32% in FY24 to 13.91% in FY26.

Large-scale capital mobilisation

- Around ₹65,000 crore in private investment mobilised.
- Strong developer participation due to payment security mechanisms, transparent bidding and low-risk framework

Tariff stability across consumer segments

- Estimated savings of around ₹82,000 crore over five years through renewable integration.
- First instance of tariff reduction across all consumer categories. Under a business-as-usual scenario, ACoS would have risen at a CAGR of 9.19% between FY25 and FY30. The estimated actual CAGR is a reduction of 1.96%.

Infrastructure and capex optimisation

- Defers transmission capital expenditure through decentralised generation.
- A one-time grant of ₹25 lakh per substation improves infrastructure without a recurring burden.

Improved investment climate

- The payment security fund of ₹100 crore per 1,000 MW reduces investor risk.
- Competitive tariffs deliver cost efficiency.

3.4.10 Learnings from MSKVY 1.0 and MSKVY 2.0

Table 3.7 Learning 1, slow pace of capacity addition

Problem statement	▸ MSKVY 1.0 established the conceptual viability of feeder-level solarisation, and implementation was slow. ▸ Against the wider agricultural feeder solarisation opportunity, only about 550 MW was commissioned under the original scheme.
Key learning	▸ A conventional project-by-project model was inadequate for large-scale decentralised solar deployment. ▸ Individual project development leaned too heavily on developers resolving land, approvals, evacuation and financing risks on their own.

Table 3.7 Learning 1, slow pace of capacity addition	
Action taken under MSKVY 2.0	▸ MSKVY 2.0 was redesigned as a mission-mode programme. ▸ The target was set at solarising 30% of agricultural feeders, initially about 7,000 MW, with implementation ambition later rising to about 16,000 MW of decentralised solar capacity. ▸ A programme-level institutional structure, a digital monitoring framework and a large-scale tendering strategy were introduced.

Table 3.8 Learning 2, land availability and aggregation bottlenecks	
Problem statement	▸ The biggest implementation challenge was the availability of suitable land near substations. ▸ Developers faced delays in identifying, verifying, leasing and securing possession of land. ▸ Land parcels were commonly scattered, unverified, or out of line with substation capacity and evacuation feasibility.
Key learning	▸ Land availability must be mapped, verified, prioritised and linked to substation capacity before bids are invited.
Action taken under MSKVY 2.0	▸ A digital land bank portal was created. ▸ Government and private land within a five to 10 km radius of substations was mapped. ▸ Around 40,000 acres were mapped in a short period using Mahabhulekh, PM Gati Shakti, GIS layers and other IT platforms. ▸ District Collectors were given an active role in identifying government and private land. ▸ Government land is made available at nominal lease rates, and private landowners receive structured compensation.

Table 3.9 Learning 3, compensation and farmer participation	
Problem statement	▸ Farmers were treated as electricity consumers rather than as economic participants in solarisation. ▸ Private landowners had limited certainty of incentive for leasing land. ▸ The absence of a transparent compensation structure restricted voluntary land participation.
Key learning	▸ Farmer participation improves when solarisation creates a direct and predictable income stream. ▸ Landowners need bankable, transparent and escalating lease compensation.
Action taken under MSKVY 2.0	▸ Private landowners and farmers are offered lease rent of ₹1.25 lakh per hectare a year, with 3% annual escalation. ▸ The lease model lets landowners monetise barren or underutilised land while continuing to benefit from improved agricultural power supply.

Table 3.10 Learning 4, grid connectivity and evacuation constraints	
Problem statement	▸ Limitations in 11 kV, 22 kV and 33 kV infrastructure, transformer capacity, bay availability and feeder readiness delayed projects.
Key learning	▸ Grid strengthening belongs in the scheme design from the outset.
Action taken under MSKVY 2.0	▸ Substation-wise solar capacity is planned against agricultural energy requirement and transformer ceiling capacity. ▸ A strengthening grant of ₹25 lakh per substation is provided to MSEDCL. ▸ Developers are given upfront technical data. ▸ Advance grid connectivity approvals and NoCs are built into the implementation process.

Table 3.11 Learning 5, fragmented project sizes and economies of scale	
Problem statement	▸ Many feeder-level solar projects were small and dispersed. ▸ Smaller project sizes raised development cost, financing cost and execution complexity. ▸ Developers had limited room to optimise procurement, engineering and evacuation costs.
Key learning	▸ Distributed renewable projects must be aggregated to achieve scale benefits. ▸ Bidding individual small projects reduces developer interest and weakens tariff discovery.
Action taken under MSKVY 2.0	▸ MSKVY 2.0 introduced project grouping and cluster-based bidding. ▸ Open tender structures were also created, allowing developers to select substations across the state.

Table 3.12 Learning 6, statutory approvals and administrative delays	
Problem statement	▸ Developers had to obtain approvals from several departments. ▸ Delays in permissions, NoCs and project registration slowed commissioning.
Key learning	▸ Multi-departmental approvals can be managed efficiently only through a centralised, time-bound, digitally monitored system. ▸ Without escalation mechanisms, administrative delays become avoidable losses.
Action taken under MSKVY 2.0	▸ A Single Window Portal was introduced. ▸ Developers can apply for statutory approvals online. ▸ Applications are tracked with time stamps, email alerts, reminders and escalation workflows. ▸ Deemed approval provisions apply where inaction is prolonged. ▸ The Standing Committee monitors and resolves inter-departmental bottlenecks.

Table 3.13 Learning 7, developer risk and bankability	
Problem statement	▸ Developers faced high pre-construction risk on land, clearances, grid connectivity, financing and payment certainty.
Key learning	▸ Competitive tariffs require risk to be reduced before bidding. ▸ Developers and lenders need certainty on land, approvals, payment security and scheme eligibility.
Action taken under MSKVY 2.0	▸ Pre-bid SPV structures were introduced, particularly for projects on government land. ▸ SPVs can hold land parcels, approvals and clearances before transfer to successful bidders. ▸ Payment security mechanisms include letters of credit and a revolving payment security fund of ₹100 crore per 1,000 MW.

Table 3.14 Learning 8, digital governance	
Problem statement	▸ Project progress, land status, approvals, commissioning milestones, generation and billing were not managed through a unified real-time digital framework. ▸ Transparency was limited and decision-making slow.
Key learning	▸ A large decentralised solar programme needs an integrated digital backbone. ▸ Programme decisions must rest on live project data rather than periodic manual reporting.
Action taken under MSKVY 2.0	▸ A dedicated MSKVY 2.0 PMU portal was developed. ▸ The portal covers the land database, SPV operationalisation, single window clearances, implementation tracking, commissioning, billing, CFA milestone tracking and performance monitoring.

Table 3.15 Learning 9, stakeholder accountability	
Problem statement	▸ Several entities were involved, and accountability and coordination were not sufficiently institutionalised.
Key learning	▸ The success of feeder solarisation depends on coordinated governance. ▸ Each stakeholder needs a defined role, an escalation pathway and a performance obligation.
Action taken under MSKVY 2.0	▸ Clear roles were assigned to each stakeholder, creating a structured governance architecture for mission execution.

Table 3.16 Learning 10, incentive alignment for local communities	
Problem statement	▸ Local institutions such as Gram Panchayats had limited direct financial incentive. ▸ Community ownership and local support were not fully embedded in the implementation model.
Key learning	▸ Local acceptance improves when communities see direct financial and developmental benefits. ▸ Village-level institutions should be made stakeholders in the solarisation programme.
Action taken under MSKVY 2.0	▸ Gram Panchayats hosting solar projects receive a social development grant of ₹5 lakh a year for three years. ▸ This aligns local governance with project success and supports community-level development.

3.5 Magel Tyala Saur Krushi Pump Yojana (MTSKPY)

The Magel Tyala Saur Krushi Pump Yojana (MTSKPY) is Maharashtra's flagship state-funded off-grid solar pump scheme. It is one of the most important complements to Maharashtra's feeder-level strategy. The scheme aims to provide 500,000 agricultural solar pumps over five years as new connections for farmers. General category farmers pay only 10% of the cost and SC and ST farmers pay 5%, with the balance met by the state and central governments. The scheme links pump size to landholding bands and requires a viable water source. Unlike PM-KUSUM Component B, which requires central government allocation and subsidy routing, MTSKPY operates on state resources, supplemented by AIIB loan financing and Tax on Sale of Electricity (TOSE) funds.

The scheme is positioned as a state-led mission with significant subsidy support and a limited beneficiary contribution.

Table 3.17 MTSKPY, scheme parameters	
Target	500,000 pumps over five years
Farmer contribution	10% for general category farmers, 5% for SC and ST farmers
Subsidy and financing structure	▸ 30% to 35% from the Government of Maharashtra ▸ The balance through an AIIB loan of 60%, repaid from the Tax on Sale of Electricity fund
Installation timeline	Within two months of work order issuance
Maintenance support	Five-year comprehensive maintenance contract

3.5.1 Implementation architecture and process design

The programme runs through an in-house MSEDCL online portal, enabling real-time application handling, process tracking and implementation monitoring. The digital architecture is what delivers transparency, speed and quality control. It covers six areas.

- An end-to-end online system covering application, invoicing, surveys, inspections and approvals.
- A farmer-centric application process, allowing beneficiaries to apply from home.
- A joint survey model involving vendor representatives and field staff to improve technical accuracy.
- Time-bound execution, with installation to be completed within two months from Work Order issuance.
- Digital monitoring of material inspection and vendor progress.
- A five-year comprehensive maintenance contract (CMC) provision to support long-term system performance and reduce maintenance burden on farmers.

3.5.2 Process flow

The process design combines administrative control, farmer choice, field-level validation and service assurance in one standardised framework.

- Scrutiny of application by SDO.
- Application approval.
- Beneficiary contribution payment.
- Vendor selection by farmer.
- Joint survey by lineman and vendor representative.
- Approval of the joint survey report by the Circle.
- Work order issued.
- Pump installation.

3.5.3 Execution capability

MSEDCL accelerated the implementation of the 'Magel Tyala Saur Krishi Pump' Yojana, aligning it with the national PM-KUSUM-B initiative.

Maharashtra has emerged as the clear national leader, accounting for over 65% of all off-grid solar pumps installed across the country.

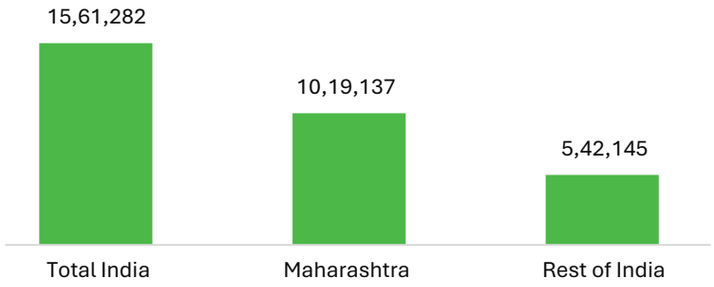


Figure 3.12 Off-grid solar pump installations, India, Maharashtra and rest of India

From FY24 to FY26, the off-grid solar pumps installations by MSEDCL rose by 654,488, with PM-KUSUM B scheme reaching maturity while MTSKPY stands at 72% of the sanctioned target.

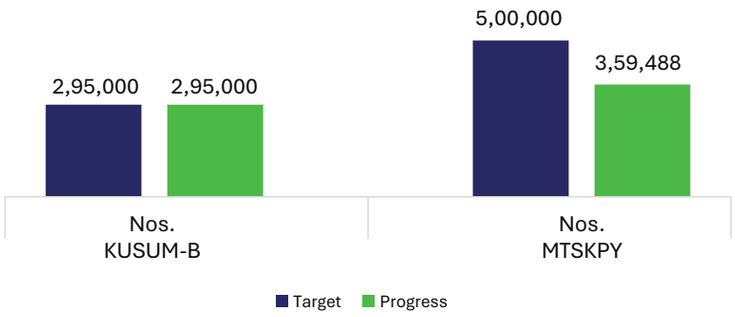


Figure 3.13 PM-KUSUM B and MTSKPY, progress against target, FY24 to FY26

MSEDCL's execution speed earned recognition from the Guinness Book of World Records for the highest number of installations by a single utility in a single month, at 45,911. The scale of it rested on coordination with local vendors, village officials and the agricultural community to deploy at speed in remote areas.

The rigorous documentation and validation safeguards undertaken as a part of compliance measures during the assessment have been shown below:

Only fully functional, operational solar-pumps were counted for the record	Each installed site had undergone pre-survey and post-installation inspection, with reports submitted	Each installation had a unique beneficiary number/serial number, and included signed, dated installation reports by the responsible engineer
For each working pump, RMS data, GPS coordinates, photographs, and videos were recorded and consolidated	An independent third-party audit verified the total installations within 30 days	Two independent solar-energy experts confirmed the verified total with the submission of the final report including installations, locations, evidence, auditor verification, and witness confirmations



Image 3.2 Guinness World Records recognition for MSEDCL, 45,911 solar pumps installed in a single month

3.5.4. Social impact

3.5.4.1. Socio-economic benefits

Reliable power for irrigation

- Farmers have assured daytime power for irrigation, free of dependence on grid electricity or power cuts.

No electricity bills

- Farmers have no monthly electricity charges.

Reduced diesel use

- Solar pumps replace diesel pumps, reducing fuel costs, noise, and air pollution.

Supports sustainable groundwater use

- With training and awareness, solar pumps encourage efficient water use and conservation practices

Lower operating and maintenance costs

- Solar pumps have fewer moving parts, which means minimal maintenance and long service life.

Environmental benefit

- Clean and renewable energy reduces greenhouse gas emissions and supports climate-resilient agriculture

Improved farm productivity and income

- Reliable irrigation enables timely watering, better crop yields, and increased farmer income

Suitable for remote and rural areas

- Well suited to villages and farms where grid electricity is unavailable or unreliable.

Reduced load on distribution system

- Off-grid pumps reduce agricultural load on DISCOM, improving overall grid stability.

3.5.4.2 Financial impacts

3.5.4.2.1 Cost benefit analysis

Under PM-KUSUM B, the scopes of off-grid pump installations are split between MEDA and MSEDCL, while the scope of MTSKPY is entirely under MSEDCL. Table 3.18 sets out the key cost benefit parameters from the utility's perspective, across the project timeline.

Table 3.18 MTSKPY and PM-KUSUM B, cost benefit inputs against target installations

Description	Unit	Against target installations
Off-grid solar pumps	No.	1,075,000
PM-KUSUM B by MEDA	No.	280,000
PM-KUSUM B by MSEDCL	No.	295,000
MTSKPY	No.	500,000
Annual units generated by solar pumps	MU	5,971
Annual power purchase cost savings	₹ crore	2,872
Annual savings in cross-subsidy	₹ crore	2,812
Annual savings in government subsidy	₹ crore	1,181
Annual savings in farmer energy bills, at MERC approved rates	₹ crore	2,865
Annual savings in farmer energy bills, at consumer rates	₹ crore	1,684

Source: MSEDCL internal analysis

Assumptions

Units generated are calculated separately for each pump size. Average monthly generation is taken as 329.5 kWh for a 3 HP pump, 549.1 kWh for 5 HP and 823.8 kWh for 7.5 HP.

Power purchase cost savings are derived from MSEDCL's average power purchase cost of ₹4.81/kWh.

Cross-subsidy savings are derived at MERC approved rates. Energy and wheeling charges are ₹4.17 a unit across 3 HP, 5 HP and 7.5 HP pumps. Demand charges are ₹47 per HP a month for all pumps, fuel and other cost adjustments ₹0.20 a unit, and average cost of supply ₹9.08 a unit.

Government subsidy savings are derived at government subsidy rates. Energy and wheeling charges are ₹2.03 a unit for 3 HP pumps and ₹1.73 a unit for 5 HP and 7.5 HP. Demand charges are ₹15 per HP a month for all pumps.

Savings in farmer energy bills are derived on two bases.

At MERC approved rates. Energy and wheeling charges of ₹4.17 a unit across all three pump sizes, demand charges of ₹47 per HP a month, and fuel and other cost adjustments of ₹0.20 a unit.

At consumer rates. Energy and wheeling charges of ₹2.14 a unit for 3 HP pumps and ₹2.44 a unit for 5 HP and 7.5 HP, demand charges of ₹32 per HP a month, and fuel and other cost adjustments of ₹0.20 a unit.

Table 3.19 sets out the annual cost benefit outcome for the utility and other stakeholders.

Table 3.19 MTSKPY, annual cost benefit outcome by stakeholder

Sl. no.	Entity	Outcome
1	Utility	The utility's cost position strengthens, with reduced exposure to procurement for agricultural supply.
2	Government	A smaller subsidy support requirement, and better predictability of agricultural subsidy obligations. Less cross-subsidy pressure embedded in agricultural supply, subject to tariff and regulatory treatment.
3	Farmers	Annual bill relief for agricultural consumers.

Pump installation rates fell substantially across successive tenders. The most recent rounds discovered rates 23.1% to 25.2% below the SECI benchmark, as shown in Figure 3.14).

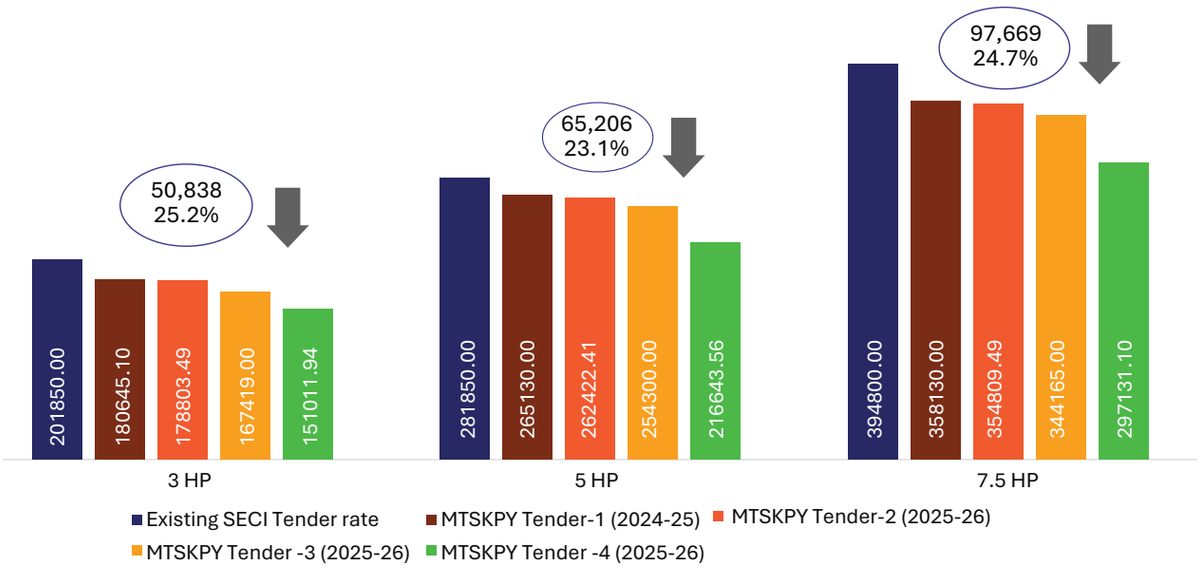


Figure 3.14 Reduction in solar pump installation rates across successive tenders, by pump capacity
Source: MSEDCL Internal Analysis

3.6 Financing aspects

3.6.1 System strengthening works under ADB funding

To support MSKVY 2.0 implementation, the scheme has been aligned with ADB's Maharashtra Power Distribution Enhancement Program for Agricultural Solarisation, which focuses on agricultural feeder solarisation, rural distribution network strengthening, substation monitoring, battery energy storage systems, and green skilling. ADB has approved sovereign loan to the Government of India of USD 460 million in a results-based lending (RBL) format, alongside a USD 40 million concessional loan from the Clean Technology Fund.

Against a total project cost of USD 715 million, the financing is structured across two results-based lending phases, RBL-I and RBL-II, with a proposed financing mix of 70% loan assistance and 30% state government contribution. The distribution system strengthening component is a critical enabler for MSKVY 2.0, as daytime agricultural load will increasingly be met through decentralised solar injection at or near rural substations.

As part of this component, MSEDCL has finalised and published 10 tenders for

distribution-system-strengthening works, with an implementation period of 18 months from issuance of Letter of Award (LoA). These works will raise the capacity and reliability of the distribution network, address substation and feeder-level constraints, improve voltage regulation and secure effective evacuation and use of solar power generated under MSKVY 2.0.

3.6.2 The AIIB-funded integrated programme

The Asian Infrastructure Investment Bank (AIIB) has approved a sovereign financing facility of USD 1.1 billion for the 'Maharashtra Climate Resilient Distributed Renewable Energy Access Program'. The programme was approved on 25 September 2025 to promote distributed renewable energy in Maharashtra, providing farmers with reliable daytime electricity through off-grid solar water pumps and strengthening the distribution system to support future agricultural feeder solarisation.

The programme is structured as a Results-Based Program (RBP) and finances identified portions of two major Government of Maharashtra initiatives, MTSKPY and MSKVY 2.0. It is an integrated programme because it combines support for farm-level off-grid solar irrigation pumps with investments aimed at distribution network strengthening and feeder-level solarisation preparedness.

The programme has three principal components. The first is financing for 500,000 off-grid solar water pumps over five years. The second is distribution system strengthening, including the upgradation of transformers, breakers, feeders and related infrastructure, to optimise power distribution and accommodate the growing share of solar energy in the system. The third is technical assistance and capacity building, to strengthen the implementation capacity of the responsible agencies and improve programme delivery and beneficiary outcomes.

Financing is 40% grant from the Government of Maharashtra and 60% loan from AIIB. The State Government will take the loan and repay it over 20 years from funds accumulated via Tax on Sale of Electricity (TOSE) and Green Energy Cess collected through electricity bills.

The AIIB-funded programme is therefore a major policy and investment initiative in Maharashtra's rural energy transition. Linking off-grid solar irrigation access for farmers with distribution system modernisation and feeder solarisation readiness should improve the quality and timing of agricultural power supply, reduce subsidy-related stress on the distribution utility, support renewable energy adoption and build resilience across the state's electricity and irrigation systems.

3.7 Solarisation of lift irrigation schemes

Under this approach, solar PV systems power centralised pumping stations that lift water from a river/canal to a distribution tank, from where gravity-based channels distribute to fields. MSKVY 2.0 solarises agricultural pump feeders, and it does not extend to power consumption under lift irrigation schemes (LIS). MSEDCL is the nodal agency for LIS solarisation, and the projects will be set up on land belonging to the Water Resources Department.

Implementation model. Solar projects will be developed on land owned or provided by the Water Resources Department, GoM. MSEDCL will procure solar power from these projects through a competitive bidding process, including reverse e-auction

Progress:

- A tender was floated on 15 March 2024, for 1,052 MW of solar capacity.
- Work orders for 905 MW have since been issued to solar developers and power purchase agreements have been signed.
- Excluding the Vidarbha Irrigation Development Corporation, evacuation and sub-evacuation agreements for the remaining areas have been completed and the scheme is progressing.

3.8 Other solar schemes

Two further solar schemes run in rural Maharashtra; both aimed at the consumer categories least able to meet their own energy costs.

3.8.1 SMART, the Swayampurn Maharashtra Awasiya Rooftop scheme

The Swayampurn Maharashtra Awasiya Rooftop Scheme (SMART) accelerates the deployment of residential rooftop solar capacity across Maharashtra, reducing dependence on the conventional grid and contributing to state and national renewable energy targets through active citizen participation.

The scheme provides free electricity for up to 25 years to below poverty line (BPL) households and consumers in the economically weaker sections (EWS). Rooftop solar systems of 1 kW will be installed at beneficiaries' residences. With substantial subsidies from the central and state governments, beneficiaries bear only a nominal share of the project cost.

The SMART Scheme has an overall financial outlay of ₹655 crore and aims to cover around 500,000 households, including 154,000 BPL consumers and 345,000 EWS consumers with monthly electricity consumption below 100 units. Beyond meeting their own electricity requirements, beneficiaries will also be able to earn supplemental income by exporting surplus power to the grid.

Implementation of the scheme is proposed on a first-come, first-served basis to ensure transparent and orderly rollout.

As of 14 June 2026, 272,388 applications have been received from power consumers. A tender process has been conducted and 43 vendors empanelled.

3.8.2 Solar village scheme

public water works, street lighting, schools, and Gram Panchayat offices, is met exclusively through solar plants installed within the village.

To strengthen the financial sustainability and scalability of the initiative, efforts were undertaken to develop funding partnerships with industries under their corporate social responsibility (CSR) programmes, while also leveraging government subsidies available under the PM-Surya Ghar Muft Bijli Yojana.

Under the programme, Manyachiwadi in Satara district became the first village in Maharashtra to achieve complete solarisation. Building on this success, 17 villages have since been solarised across the state.

The scheme now aims to solarise at least one village in each district, extending the community-based renewable energy model throughout Maharashtra. The initiative places Maharashtra among the leading states in community-based solar transformation.

3.9 Grid strengthening

MSEDCL's planning approach is best read as an integrated transmission and distribution (T&D) development strategy, designed so that generation capacity addition, renewable integration, storage deployment, demand growth and affordability objectives move together. The transmission plan creates high-capacity, interconnected corridors and layered grid structures to evacuate renewable energy and serve major load centers. The distribution plan complements this by strengthening the last-mile network, deploying smart meters, reducing losses, and improving system monitoring.

Maharashtra's Energy Transition Plan provides for six interconnected transmission corridors by 2030. These corridors will connect generation hotspots with nearly 70% to 75% of Maharashtra's projected peak demand. To accelerate the build-out, the plan proposes wider use of the tariff-based competitive bidding (TBCB) framework. A lower TBCB threshold should encourage wider private sector participation and improve execution efficiency. Expected benefits are a 20% to 30% reduction in project cost and a 30% to 40% reduction in completion timelines. This investment and procurement strategy directly supports MSEDCL's objective of timely infrastructure creation, competitive cost discovery and faster execution of critical grid projects.

On the distribution side, network addition and strengthening cover substations, lines and cables, distribution transformers, system monitoring and related infrastructure. Smart metering investments cover consumer smart meters as well as distribution transformer and feeder-level metering. Loss-reduction investments cover feeder separation, tamper-proofing and other measures to reduce technical and commercial losses.

3.10 Demerger of MSEDCL's agriculture business

3.10.1 MSEDCL financial overview

MSEDCL serves over 30 million consumers, including 4.5 million agricultural consumers. Agricultural electricity supply is of considerable social, economic and developmental importance to the state. Maharashtra's energy transition strategy and agricultural solarisation agenda have created the foundation for a major restructuring of MSEDCL.

The Government of Maharashtra has proposed three interconnected initiatives, together intended to sharpen operational focus, strengthen financial sustainability and improve service delivery.

- Financial restructuring of MSEDCL
- Demerger of agriculture distribution business into MSAPL
- Listing of the non-agriculture business

As of 31 March 2025, MSEDCL had accumulated agricultural receivables of around ₹76,189 crore (about ₹762 billion). Borrowings exceed ₹90,000 crore, with over ₹50,000 crore of repayments falling due across the next four years at an average borrowing cost of 9.20% a year. The debt service coverage ratio (DSCR) stands below 1, which is short of satisfactory debt servicing levels. Together these constrain investment capacity and make restructuring necessary.

3.10.2 Structure of the demerger

Under the restructuring framework, MSEB Solar Agro Power Limited (MSAPL), incorporated on 31 May 2023, will function as an agriculture distribution company. It will manage agriculture consumers and associate assets and liabilities under the approved transfer scheme.

The non-agriculture entity will continue to serve residential, commercial and industrial consumers. Following the restructuring, it is proposed for listing.

Agricultural solarisation calls for a dedicated institutional framework, because agricultural supply carries requirements of its own, namely feeder-level solar planning, daytime supply objectives, subsidy accounting, a farmer-service focus and separate financial accountability. MSKVY-linked solarised supply, renewable power, and low-cost power allocation to the agri entity are central to the proposed model, while MSEDCL continues to procure and supply power to the agri entity under the operating structure.

3.10.3 Pillars of the transformation strategy

Financial Restructuring

- GoM takeover of **₹32,679 Cr.** guaranteed debt through Government securities
- Matching write-off of agri receivables
- Refinancing of balance borrowings for longer tenure and lower interest burden

Agri Demerger

- Creation of MSAPL as a dedicated agri-discom
- Transfer of meters, deposits, last-mile infrastructure, agri receivables and agri payables to MSAPL
- MSEDCL provides services for O&M, billing, collection and complaint management

IPO for MSEDCL

- IPO targeted in 6 to 9 months after demerger notification, combining fresh issue for growth capital and OFS by GoM/MSEB Holding.
- IPO is desirable, but restructuring is essential irrespective of IPO

Figure 3.15 Pillars of the MSEDCL agriculture demerger strategy

Demand in Maharashtra's power sector is expected to grow at around 6% a year in the coming years. High legacy dues and delayed subsidy release leave the DISCOMs unable to operate on sound economic principles or to invest in infrastructure. The proposed listing should raise around ₹10,000 crore (about ₹100 billion), to be applied to infrastructure, digital systems, smart metering and the energy transition. That investment equips the utility to meet future demand growth. Listing is also expected to bring greater transparency, fuller financial disclosure, market discipline and corporate governance standards.

3.10.4 Benefits to stakeholders

MSEDCL serves over 30 million consumers, including 4.5 million agricultural consumers. Agricultural electricity supply is of considerable social, economic and developmental importance to the state. Maharashtra's energy transition strategy and agricultural solarisation agenda have created the foundation for a major restructuring of MSEDCL.

The Government of Maharashtra has proposed three interconnected initiatives, together intended to sharpen operational focus, strengthen financial sustainability and improve service delivery.

Agriculture consumers. Daytime supply through solarised feeders, dedicated work force for distribution system management, focus on service quality

Residential, commercial, industrial and other consumers. Improvement in supply reliability, focused and improved digital services, enhanced transparency and reduced cross subsidy burden

MSEDCL (non-agriculture business). Stronger balance sheet, improvement in DSCR, access to capital market, improved credit profile, and greater capability for modernisation.

Government of Maharashtra. Reduced subsidy burden, improved energy-sector governance, enhance investment attractiveness

No other state has combined agricultural solarisation, dedicated agriculture distribution, financial restructuring and access to the capital market within a single framework.

Maharashtra is creating two specialised entities capable of delivering improved outcomes for farmers, consumers and government.

3.11 Media highlights

3.11.1 MSKVY 2.0



Image 3.3 Dedication of the first five solar parks under MSKVY 2.0, 5 October 2024



लोकमत

१६ हजार मेगावॉट क्षमता: शेतकऱ्यांना मिळणार दिवसा वीज

जगातील सर्वात मोठ्या विकेंद्रित सौर ऊर्जा प्रकल्पाचे पंतप्रधानांच्या हस्ते लोकार्पण

लोकमत न्यूज नेटवर्क

वाशिम: शेतकऱ्यांना सिंचनासाठी दिवसा वीज पुरवठा करण्यासाठी राज्यात उभारण्यात येणाऱ्या १६ हजार मेगावॉट क्षमतेच्या जगातील सर्वात मोठ्या विकेंद्रित सौर ऊर्जा निर्मिती प्रकल्पाच्या पहिल्या पाच सोलर पार्कचे लोकार्पण पंतप्रधान नरेंद्र मोदी यांच्या हस्ते शनिवारी (दि.५) पोहरादेवी येथे करण्यात आले.

कृषी पंपांना सौर ऊर्जेद्वारे निर्माण केलेल्या विजेचा पुरवठा करण्यासाठी केंद्र सरकारच्या प्रधानमंत्री किसान ऊर्जा सुरक्षा एवं उत्थान महाभियान अर्थात पीएम कुसुम योजनेच्या आधारे राज्यात मुख्यमंत्री सौर कृषी वाहिनी योजना २.० योजना राबविण्यात येत आहे. त्यामध्ये १२०० मेगावॉट क्षमतेचे सौर ऊर्जा निर्मिती प्रकल्प उभारणीचे काम सध्या सुरू असून, ते हप्प्याहप्प्याने सप्टेंबर २०२५ पर्यंत पूर्ण होणार आहे. त्यापैकी धोंडलगाव (जिल्हा छत्रपती संभाजीनगर), बामणी बुद्रुक (जिल्हा नांदेड), हरोली (जिल्हा कोल्हापूर), जलालाबाद (जिल्हा अकोला), पलशी बुद्रुक (जिल्हा बुलढाणा) या एकूण ५१ मेगावॉट क्षमतेच्या पहिल्या पाच प्रकल्पांचे लोकार्पण शनिवार, ५ ऑक्टोबर रोजी पंतप्रधान नरेंद्र मोदी यांच्या हस्ते करण्यात आले. सर्वतच सौर ऊर्जा निर्मिती प्रकल्प उभारणीस मदत करणाऱ्या ४११ ग्राम पंचायतींना पंतप्रधानांच्या हस्ते २०.५० कोटी रुपये विकास निधी ऑनलाईन पद्धतीने देण्यात आला. शेतकऱ्यांना कृषी पंपांसाठी सध्या दिवसा व राजी अशा दोन पाळ्यांमध्ये वीज पुरवठा करण्यात येतो. केवळ दिवसा भरवशाचा वीज पुरवठा करण्यासाठी राज्य शासनाने एप्रिल २०२३ मध्ये मुख्यमंत्री सौर कृषी वाहिनी योजना २.० ला मंजुरी दिल्यानंतर राज्याचा ऊर्जा विभाग आणि महाविततरणकडून केवळ अडीच महिन्यात ४० हजार एकर सार्वजनिक जमीन उपलब्ध करण्यासह टेंडर प्रक्रिया, वीज खरेदीचे करार आदि बाबी पूर्ण करण्यात आली.

पुरवठा करावा, अशी त्यांची मागणी आहे. पीएम कुसुम अर्थात मुख्यमंत्री सौर कृषी वाहिनी योजना २.० चुळे शेतकऱ्यांची मागणी पूर्ण होणार आहे. या योजनेत सौर ऊर्जा निर्मितीसाठी दरवर्षी सव्वा लाख रुपये प्रती हेक्टर दराने जमीन भाडयाने देण्याचीही सुविधा शेतकऱ्यांसाठी आहे.

शेतकऱ्यांसाठी दिवसा वीज पुरवठ्यासाठी मुख्यमंत्री सौर कृषी वाहिनी योजना २.० अंतर्गत पूर्ण झालेल्या १९ मेगावॉट क्षमता असलेल्या महावितरणच्या ५ सोलार प्रकल्पांचे मा. पंतप्रधान नरेंद्र मोदी यांच्या हस्ते स्विचेचे बटन दाबून लोकार्पण करण्यात आले.

४० हजार एकर जमीन केली उपलब्ध

संत सेवालाल महाराजांची मूर्ती भेट

पंतप्रधानांना सेवालाल महाराजांची मूर्ती प्रदान करताना मुख्यमंत्री, उपमुख्यमंत्री.

घंशारा वसली पोहरादेवी येथील कार्यक्रमात पंतप्रधान नरेंद्र मोदी यांनी नंगारा वास्तू अर्थात बंजारा विरासत संग्रहालयाचे लोकार्पण केल्यानंतर आयोजित करण्यात आलेल्या सभेदरम्यान बंजारा बांधवांच्या दैवती स्थान संत सेवालाल महाराजांची मूर्ती भेट म्हणून देण्यात आली. ही मूर्ती मुख्यमंत्री एकनाथ शिंदे, उपमुख्यमंत्री देवेंद्र फडणवीस, उपमुख्यमंत्री अजित पवार, पालकमंत्री संजय राठोड यांच्या हस्ते पंतप्रधानांना प्रदान करण्यात आली.

किसान सन्मान, नमो महासन्मानच्या हप्त्यांचे वितरण

- पंतप्रधान नरेंद्र मोदी यांनी पोहरादेवी येथील कार्यक्रमात कृषी व पशूसवर्धनच्या विविध उपक्रमांचा श्रीगणेशा करतानाच देशातील ९.५० कोटी शेतकऱ्यांना २० कोटी रुपयाचा पीएम किसान सन्मान निधीचा १८ वा हप्ता वितरित केला. सोबतच राज्य शासनाच्या नमो शेतकरी महासन्मान निधी योजनेच्या सुमारे २ हजार कोटी रुपयांच्या पाचव्या हप्त्याचेही वितरण केले.
- या कार्यक्रमात लाडकी बहिण योजनेच्या चार लाभार्थी महिलांना पंतप्रधानाच्या हस्ते लाभाच्या प्रतिनिधिक धनादेशाचे वितरण करण्यात आले.

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लोकमत समाचार

Image 3.4 Marathi press coverage of the MSKVY 2.0 solar park dedication



PM Mo Times of India, Pune Sunday, October 06, 2024

Five solar parks with 19MW capacity launched in Maha

Mumbai: Prime Minister Narendra Modi launched five solar parks with a total capacity of 19MW for Maharashtra on Saturday.

"The five solar parks are part of the world's largest distributed solar power generation project of 16,000MW capacity being developed in Maharashtra. It will ensure lakhs of farmers get electricity supply for agriculture during daytime," said MSEDCL managing director Lokesh Chandra.

The five projects of Dhondalgaon in Chhatrapati Sambhajinagar, Bamni Budrak in Nanded, Haroli in Kolhapur, Jalalabad in Akola, and Palshi Budruk in Buldhana were inaugurated by Modi at Pohradevi in Washim district. The PM also transferred Rs 20.5 crore development fund to 411 gram panchayats which helped in developing solar projects. The solar parks are part of Mukhyamantri Saur Krishi Vahini Yojana 2.0 and were created with Central assistance. "Tender process for the development of 4800 MW solar power projects has been completed and work orders have been given," Chandra said. "All projects with a total capacity of 16,000 MW will be completed by March 2026 and farmers will be supplied with electricity generated entirely on solar energy," he said.

As electricity will be available at an average cost-effective rate of Rs 3 per unit instead of the current rate of Rs 8.50, there will be a saving of Rs 10k cr per year in power purchase. As a result, the burden of annual subsidy of Rs. 4,500 crore on state govt and cross subsidy of Rs. 13,000cr on the industries will be removed. Green energy will help to protect environment, he added.

—Somit Sen

Image 3.5 English press coverage of the MSKVY 2.0 solar park dedication

Nagpur Post

Nagpur, Saturday 27 September 2025

MIS

Massive job creation through solar power projects: PM Narendra Modi

PM inaugurates 454 Solar Power Projects of 2,458 MW capacity in the State, in the presence of CM Devendra Fadnavis



Mumbai 26 September: Solar power projects are providing daytime electricity to farms, which is doubling the economic income of farmers. However, farmers should focus on natural farming and adopt cropping patterns that yield higher production at lower costs. Protecting and enhancing soil health is the need of the hour. Prime Minister Narendra Modi stated that these solar energy projects are generating large-scale employment. Prime Minister Narendra Modi virtually inaugurated 454 solar power projects with a capacity of 2,458 MW in the state. Chief Minister Devendra Fadnavis was present on the occasion.

Inauguration and Dialogue

The inauguration ceremony for energy and various development schemes was held in Banswara, Rajasthan. The event was streamed online from Prakashgad, Bandra East. Chief Minister Devendra Fadnavis, MSEDCL Chairman and Managing Director Lokesh Chandra, Mahagenco Managing Director Radhakrishnan B, and beneficiary farmers of the state's PM KUSUM C - Mukhyamantri Solar Krishi Vahini Yojana 2.0 and PM KUSUM C B - 'Solar Agriculture Pump on Demand' schemes were present. During the program, Prime Minister Narendra Modi interacted with various beneficiaries of the state's solar power projects.

Prime Minister Narendra Modi highlighted the many benefits of solar power projects.

Farmers are getting daytime electricity for agriculture, along with the provision of perennial water supply. This has increased farmers' income. Now, farmers must focus on chemical-free farming.

'Zero Cost Farming' should also be given importance. Zero Budget Natural Farming is a method of agriculture that reduces costs by minimizing the use of chemical fertilizers and pesticides, thereby saving farmers' financial investment in farming and improving soil health. Furthermore, it is essential to adopt modern farming methods instead of traditional ones.

Focus on Edible Oilseeds and Millets

Prime Minister Narendra Modi stated that India currently has to import edible oil worth one lakh crore rupees. To solve this problem, farmers need to cultivate edible oilseeds. Additionally, considering the high demand for millets currently, if farmers cultivate such crops, their income will increase, and they will move towards economic self-reliance. He also appealed to the farmers to listen to the lecture on natural farming by the State Governor, Acharya Devvrat.

Following the event, Chief Minister Devendra Fadnavis introduced Prime Minister Narendra Modi to various beneficiary farmers of the solar power projects.

Success Stories of the Projects

Prime Minister Narendra Modi learned about the success stories of the projects through interaction with the beneficiaries. Prime Minister Narendra Modi learned about the success stories of the projects by directly communicating with the beneficiaries.

Sunil Sitaram Kakulte, a farmer from Kikwari in Satana taluka of Nashik district, brought 40 acres of land under irrigation through the PM KUSUM C - Mukhyamantri Solar Krishi Vahini Yojana 2.0. He reported an annual income increase of Rs 2 lakh and job creation for 50 to 60 people.

Tushar Wankhede, a farmer from Bhendi Mahal in Barshi Takli taluka of Akola district, implemented a 10 MW solar power project on 6.5 acres under the PM KUSUM C - Mukhyamantri Solar Krishi Vahini Yojana.

He explained that earlier, difficulties arose due to the lack of electricity at night, and crops like chickpeas were grown due to water scarcity. Now, by growing papaya and banana, he is earning Rs 60,000 instead of Rs 35,000.

Surat Jatale from Satephad in Jafrabad taluka of Jalna district installed a 5 HP pump under the 'Solar Agriculture Pump on Demand' scheme. This scheme significantly boosted his farm income.

He stated that his annual income increased from sixty thousand rupees to one and a half lakh rupees since the pump installation. He mentioned that three family members work on the farm, and the profit is used for his son's education and reinvesting in farming. Tai Kishor Sawant, a farmer from Bapkal in Jalna district, said she installed a 3 HP solar pump for a two-acre area under the PM KUSUM B - 'Solar Agriculture Pump on Demand' scheme. This resulted in increased production of the soybean crop. She also noted that the surplus electricity is used in the house via an inverter. Madhuri Dhumal from Mai Vasti Peth in Ambegaon taluka of Pune district has set up a 10 MW solar power project on 10 acres under the PM KUSUM C - Mukhyamantri Solar Krishi Vahini Yojana 2.0. She stated that farmers in the area are receiving daytime electricity, which has significantly increased their income, with the project yielding an annual income of Rs 15 lakh.

Image 3.6 Press coverage of solar-linked job creation in Maharashtra



THE SOLAR FIELDS OF MAHARASHTRA: HOW INDIA'S MOST PROGRESSIVE STATE IS BETTING ITS FUTURE ON THE SUN

In the villages where farmers once prayed for rain, they now worship at the altar of solar panels—and it could change everything

Sunita Patil used to wake up at 4 AM to pump water for her sugarcane fields in Ahmednagar district. The electricity would come on in the dead of night—if it came at all—forcing millions of Maharashtra's farmers into a nocturnal existence that defied every natural rhythm of agriculture. But on a blazing afternoon last month, as solar panels gleamed across her neighbour's farm, Patil witnessed something that would have seemed impossible just two years ago: water flowing freely from an electric pump at high noon, powered entirely by the sun beating down on their fields.

"For the first time in my life, I can work when the sun is up and sleep when it's dark," Patil says, squinting against the light reflecting off what locals now call their "silver harvest." She's one of four million farmers about to be swept up in the world's largest agricultural solar revolution—a $40 billion gamble by Maharashtra that could either illuminate India's path to a carbon-neutral future or serve as an expensive cautionary tale about the perils of betting everything on renewable energy. Maharashtra's electricity appetite rivals entire nations—consuming as much power as the United Kingdom, Spain, or Australia. With 34 million consumers generating $14.5 billion in annual revenue, the state faces a staggering challenge: energy demand growing at 6.3% annually while historic capacity addition has been just 1 gigawatt per year.

Key Drivers of the Energy Transition:

- 16 GW agricultural feeder solarization (world's largest program)
- Time-of-day tariffs incentivizing daytime solar consumption
- 3-5 GW rooftop solar installations
- 1-2 GW demand reduction through efficiency measures

The Arithmetic of Transformation
The numbers behind Maharashtra's solar revolution read like the specifications for terraforming a planet:

Current vs 2030 Targets	Present	2030 Goal	Change
Total Capacity	46.1 GW	85.8 GW	86%
Renewable Share	30% (11.1 GW)	60% (39.7 GW)	258%
Peak Demand	29 GW	45 GW	55%
Energy Consumption	185,000 MUs	282,000 MUs	53%
Carbon Intensity	0.86 kg CO2/kWh	0.55-0.60 kg CO2/kWh	-32%

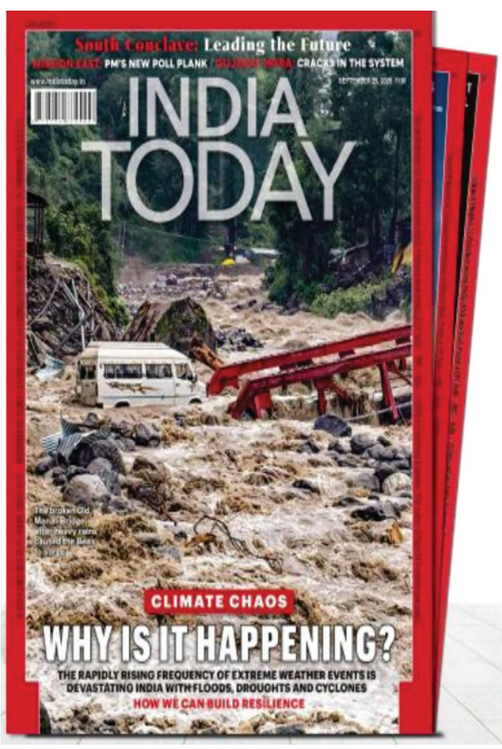


Shri Devendra Fadnavis
Hon'ble Chief Minister of Maharashtra

"Maharashtra is determined to lead India's clean energy revolution. Through initiatives like the Solar Agricultural Feeder Scheme 2.0, the PM Surya Ghar Free Electricity Scheme, and the creation of model solar villages, we are ensuring that affordable, reliable, and sustainable power reaches every household and every farm. By aligning with the Gati Shakti framework and focusing on execution with speed and precision, we are not just building infrastructure—we are building a greener, stronger future for generations to come."

The Villages That Became Power Plants

Drive through Maharashtra's countryside today, and you'll see the answer taking shape in thousands of villages. Under the Mukhyamantri Saur Krushi Vahini Yojana 2.0—a name locals have mercifully shortened to MSKVY—entire agricultural feeders are being converted into distributed solar power plants.



FOCUS ENERGY

What are the biggest challenges facing Maharashtra's energy transition, particularly with MSEDCL's financial situation?
Abha Shukla: "The solar transition is as much about saving MSEDCL as saving the climate. Our distribution utility has been hemorrhaging money for years, which is why we've developed a comprehensive transformation plan. We're targeting 5% Profit Before Tax and potential public listing within 3-4 years. This includes deploying 5 million smart meters, expanding our franchise model to 6-8 geographical areas, and implementing loss reduction measures that will generate $600 million in additional revenue."



Smt. Abha Shukla (IAS)
Additional Chief Secretary (Energy), Government of Maharashtra

How are you addressing the operational challenges of implementing such a massive distributed solar program?
Abha Shukla: "The challenges are immense—acquiring thousands of small land parcels, coordinating approvals from dozens of agencies, ensuring grid connectivity for distributed installations, and maintaining payment security for developers. We're essentially rebuilding the entire energy system while keeping it running. It's like changing the engine of a plane while flying it. That's why we're creating a separate agricultural company to streamline operations."

How does Maharashtra's energy transition fit into India's broader climate commitments?
Abha Shukla: "India has promised net-zero emissions by 2070, targeting 50% renewable penetration—500 GW—by 2030 nationally. Maharashtra's systematic approach combining generation, transmission, distribution, and demand-side management recognizes that successful energy transition requires more than just installing solar panels; it demands reimagining the entire power system."

What is Maharashtra's broader vision for energy leadership?
Abha Shukla: "We have a five-point vision: First, to be India's leader in energy transition planning and implementation. Second, achieve the fastest acceleration in renewable capacity between 2023-30. Third, become an innovation leader in agricultural solarization, storage, and green hydrogen. Fourth, facilitate over $36 billion in investment by 2030. And fifth, complete the turnaround and potential listing of our distribution company."

Can Maharashtra's model be replicated elsewhere?
Abha Shukla: "Absolutely. If Maharashtra succeeds, we won't just transform one state—we'll provide the template for decarbonizing the developing world. The distributed solar model we're pioneering in Maharashtra's villages could work in rural Indonesia, Nigeria, or Brazil. We're creating a replicable blueprint for large-scale energy transition in emerging economies."

MSKVY 2.0 Program Impact:

Metric	Target/Achievement
Capacity	16 GW
Investment	$7.5 billion ($65,000 Cr)
Rural Jobs	4,00,000
Farmers Served	4 million
Women Employment	Up to 2 million
Contract Duration	25 years

Rajesh Kumbhar, a cotton farmer in Sangli district, describes watching his first solar-powered irrigation cycle with the wonder of someone witnessing magic: "The pump started exactly at sunrise, without any switch, without any bill. The crops seemed to understand—they were getting water exactly when they needed it most."

The Economics of Revolution

Maharashtra's transformation requires unprecedented coordination and investment. Investment & Employment Projections (by 2030):

- Total investment required: $40-42 billion
- Investment retained in-state: 75%
- Direct job creation: 500,000-600,000
- Rural employment (renewable sector): 520,000
- Transmission projects: 10 TBCB projects worth $1.3 billion

The economic mathematics are compelling. Despite explosive energy demand growth, Maharashtra projects that aggregate CO2 emissions will actually decrease from 160-165 million metric tons to 155-160 million tons by 2030. Even more remarkably, electricity tariffs will remain stable at 7.4-7.5 rupees per unit, as lower renewable costs offset higher transmission investments.

Capacity Status - Already Secured:

Energy Source	Capacity Tied Up
Total Capacity	43.6 GW
Renewable Energy	40.0 GW
Agricultural Solar	16.0 GW

The Darkness Before Dawn

At the helm of this unprecedented transformation stands Smt. Abha Shukla (IAS), Additional Chief Secretary (Energy), whose vision is reshaping not just Maharashtra's energy landscape but potentially India's entire approach to renewable transition. She answers a few questions for us:

As Sunita Patil watches the sun set over her neighbor's solar panels, she's seeing the future of India itself—powered by its greatest natural resource, distributed across its most fundamental industry, and controlled by the people who work closest to the earth.

The question isn't whether Maharashtra's solar revolution will succeed. The question is whether the rest of the world is ready to follow.



Image 3.7 and 3.8 India Today feature on the impact of MSKVY 2.0, carrying comments from the Chief Minister, Shri Devendra Fadnavis, and the Additional Chief Secretary (Energy), Smt. Abha Shukla



Image 3.9 Distribution of letters of award for around 9,000 MW to solar power developers, 7 March 2024, by the Chief Minister, Shri Devendra Fadnavis, the Additional Chief Secretary (Energy), Smt. Abha Shukla, and the CMD, MSEDCL, Shri Lokesh Chandra



Image 3.10 MSKVY 2.0 progress review meeting chaired by the Additional Chief Secretary (Energy), Smt. Abha Shukla



Image 3.11 The Additional Chief Secretary (Energy), Smt. Abha Shukla, receiving the Diamond Award on behalf of the CMD, Shri Lokesh Kumar, at the India Smart Grid Forum Innovation Awards 2025, where MSKVY 2.0 was nominated in the category of Most Innovative Renewable Energy Programmes and Projects in India.

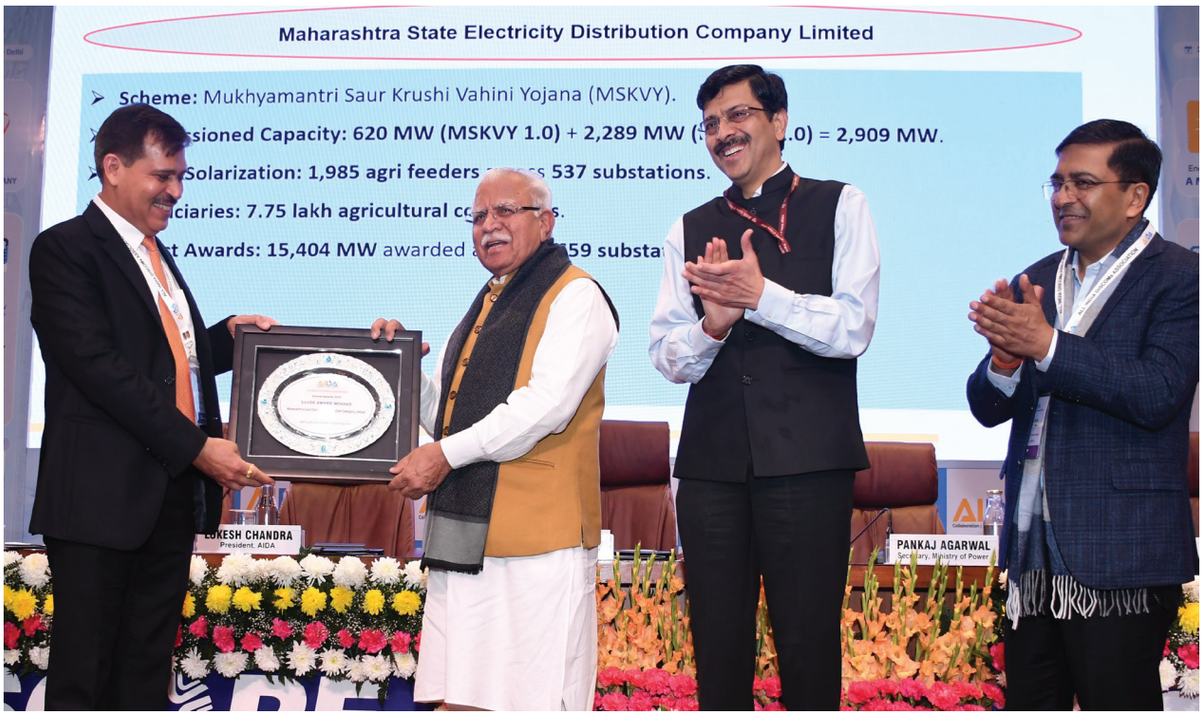


Image 3.12 The CMD, MSEDCL, Shri Lokesh Chandra, being felicitated by the Union Minister of Power, Shri Manohar Lal Khattar, at the All India Discoms Association EDICON-2026 conference, New Delhi



Image 3.13 MSEDCL's MSKVY 2.0 scheme being recognised at the Build India Infra Awards 2026

लोकमत समाचार

सौर कृषि पंप योजना में बनाया विश्व कीर्तिमान, मुख्यमंत्री की उपस्थिति में मिला प्रमाण-पत्र

'महाराष्ट्र अब रुकेगा नहीं, आगे बढ़ता रहेगा'

छत्रपति संभाजीनगर. मुख्यमंत्री देवेंद्र फड़णवीस ने कहा कि, 'राज्य सरकार का एक साल पूरा होने पर वह जनता का आभार व्यक्त करते हैं. यह वर्ष जनता को समर्पित था. सरकार की ओर से विभिन्न योजनाएं शुरु की गई हैं. अब महाराष्ट्र रुकेगा नहीं, बल्कि इसी तरह आगे बढ़ता रहेगा'.

मुख्यमंत्री सौर कृषि पंप योजना में महाराष्ट्र ने विश्व कीर्तिमान बनाया है. महावितरण की ओर से एक ही महीने में 45 हजार 911 सौर कृषि पंप लगाए गए. इसे लेकर गिनीज बुक ऑफ वर्ल्ड रिकॉर्ड्स की ओर से शुक्रवार को समीपस्थ शेंद्रा औद्योगिक परिसर स्थित ऑरिक सिटी में आयोजित कार्यक्रम में प्रमाण-पत्र प्रदान किया गया. कार्यक्रम की प्रस्तावना महावितरण के मुख्य प्रबंध निदेशक लोकेश चंद्रा ने रखी. यहां संबोधित करते हुए मुख्यमंत्री फड़णवीस ने आगे कहा कि, 'देश में सबसे ज्यादा सौर ऊर्जा का कृषि में उपयोग करने वाला राज्य बनकर महाराष्ट्र ने इतिहास रचा है. हम किसानों के लिए अलग फीडर पर सौर ऊर्जा से 16 हजार मेगावाट बिजली पैदा करेंगे. जिससे हर साल बिजली की दरों में तीन प्रतिशत की कटौती कर आम जनता को सस्ती बिजली दी जा सकेगी'.

मुख्यमंत्री ने दावा किया कि, सौर ऊर्जा परियोजना से लगभग एक लाख लोगों को रोजगार मिला है. सौर ऊर्जा में मराठवाड़ा के योगदान की सराहना करते हुए मुख्यमंत्री ने परिसर को सूखा मुक्त बनाने की घोषणा की. इस अवसर पर मंत्री अतुल सावे और राज्यमंत्री मेघना बोर्डीकर ने भी अपने विचार रखे. इस अवसर पर विधायक संजय केनेकर, अनुराधा चव्हाण, नारायण कुचे, प्रशांत बंब, सुरेश धस, मुख्यमंत्री के आर्थिक सलाहकार प्रवीण परदेशी, ऊर्जा विभाग की अतिरिक्त मुख्य सचिव आभा शुक्ला समेत विभिन्न अधिकारी और जनप्रतिनिधि उपस्थित थे.



छत्रपति संभाजीनगर में शुक्रवार को ऑरिक सिटी के आयोजित कार्यक्रम में मुख्यमंत्री देवेंद्र फड़णवीस को सौर कृषि पंप योजना विश्व रिकॉर्ड प्रमाण-पत्र सौंपते हुए गिनीज बुक ऑफ वर्ल्ड रेकॉर्ड्स के कार्ल सैबेले और अन्य.

Apna Shahar
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Image 3.14 Marathi press coverage of the MTSKPY world record, first report

दैनिक अजिंक्य भारत
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मागेल त्याला सौर कृषीपंप योजनेत महाराष्ट्राचा विश्वविक्रम

गिनीज बुकमध्ये नोंद; मुख्यमंत्री देवेंद्र फडणवीस यांच्या हस्ते प्रमाणपत्र प्रदान होणार

मुंबई, दि. ४ वृत्तसंस्था

महाराष्ट्राने मागेल त्याला सौर कृषीपंप योजनेत विश्वविक्रम केला आहे. महावितरणने एकाच महिन्यात ४५ हजार ९११ सौर कृषीपंप स्थापित करण्याचा उच्चांक केला आहे. या विक्रमाची गिनिज बुकमध्ये यशस्वी नोंद झाली आहे. गिनीज बुकतर्फे विश्वविक्रम प्रमाणपत्र प्रदान सोहळा मुख्यमंत्री देवेंद्र फडणवीस यांच्या प्रमुख उपस्थितीत शुक्रवार, दि ५ डिसेंबर २०२५ रोजी सकाळी १० वाजता छत्रपती संभाजीनगरच्या शेंद्रा एमआयडीसीमध्ये ऑरिक सिटी मैदानावर आयोजित करण्यात आला आहे.



कार्यक्रमास उपमुख्यमंत्री एकनाथ शिंदे, उपमुख्यमंत्री अजित पवार, अपारंपरिक ऊर्जामंत्री अतुल सावे, छत्रपती संभाजीनगरचे पालकमंत्री संजय शिरसाट, ऊर्जा राज्यमंत्री श्रीमती मेघना साकोरे-बोर्डीकर, ऊर्जा विभागाच्य अपर मुख्य सचिव आभा शुक्ला, महावितरणचे अध्यक्ष व व्यवस्थापकीय संचालक लोकेश चंद्र आदी मान्यवर उपस्थित राहणार आहेत.शेतकऱ्यांना केवळ दहा टक्के रक्कम भरून सौर पॅनल्स आणि कृषीपंप असा संपूर्ण संच देण्याच्या 'मागेल त्याला सौर कृषीपंप' या योजनेत महाराष्ट्राने आघाडी घेतली आहे. मुख्यमंत्री देवेंद्र फडणवीस यांनी 'मागेल त्याला सौर कृषीपंप' योजनेच्या अंमलबजावणीवर भर दिला आहे. संपूर्ण देशात महाराष्ट्राने सर्वाधिक सौर पंप बसविण्याचा उच्चांक गाठला आहे. 'मागेल त्याला सौर कृषीपंप' योजनेत शेतकऱ्यांना प्रधानमंत्री कुसुम योजनेच्या अंतर्गत केंद्र सरकारकडून ३० टक्के तर राज्य सरकारकडून ६० टक्के अनुदान मिळते. त्यामुळे केवळ दहा टक्के रक्कम भरून सिंचनासाठी कृषीपंपासह संपूर्ण संच मिळतो. अनुसूचित जाती व अनुसूचित जमातीच्या शेतकऱ्यांना केवळ ५ टक्के लाभार्थी हिस्सा भरावा लागतो. राज्यात साडेदहा लाख सौर कृषीपंप बसविण्याचे उद्दिष्ट ठेवले आहे.

> सौर पॅनल्समधून २५ वर्षे वीजनिर्मिती होत असल्याने तेवढा काळ शेतकऱ्यांना कृषीपंपाचे वीजबिल येत नाही. हे पंप पारंपरिक वीजपुरवठ्यावर अवलंबून नसल्याने शेतकऱ्यांना त्यांच्या मर्जीप्रमाणे दिवसा कधीही सिंचन करता येते. त्यामुळे दिवसा वीजपुरवठ्याची शेतकऱ्यांची मागणी पूर्ण होते.

Image 3.15 Marathi press coverage of the MTSKPY world record, second report

अब तक 7 लाख सौर पंप महाराष्ट्र में स्थापित किए गए हैं, अगले वर्ष 10 लाख और पंपों का लक्ष्य

फडणवीस का ऐलान- सौर ऊर्जा से कृषि क्रांति, बिजली दरों में हर साल 3% कटौती

विशेष प्रतिनिधि | छत्रपति संभाजीनगर

कृषि क्षेत्र में सौर ऊर्जा के बढ़ते उपयोग से महाराष्ट्र देश का अग्रणी राज्य बन गया है। किसानों के फीडर को सौर ऊर्जा पर लाकर 16,000 मेगावाट स्वतंत्र बिजली उत्पादन का लक्ष्य पूरा किया जाएगा। इससे अन्य उपभोक्ताओं के लिए बिजली दरों में हर वर्ष 3 प्रतिशत की कटौती संभव होगी, यह भरोसा मुख्यमंत्री देवेंद्र फडणवीस ने शेंद्रा एमआईडीसी स्थित औरिक सिटी मैदान में आयोजित कार्यक्रम में दिया।

एक माह में 45,911 पंप,गिनीज रिकॉर्ड दर्ज

'मागेल त्याला सौर कृषी पंप'योजना अंतर्गत महावितरण ने मात्र एक माह में 45,911 सौर पंप स्थापित कर नया कीर्तिमान बनाया, जिसे गिनीज बुक ऑफ वर्ल्ड रिकॉर्ड्स ने मान्यता दी। कार्यक्रम में विश्वविक्रम की घोषणा करने स्वयं गिनीज प्रतिनिधि कार्ल सैबेले उपस्थित रहे। मुख्यमंत्री के हाथों राज्यभर के सौर पंपों का डिजिटल लोकार्पण किया गया और किसानों से वीडियो संवाद भी हुआ।

'मागेल त्याला पंप' योजना ने बनाया गिनीज रिकॉर्ड



बैंक के साथ समझौता

सौर पंप योजना को वित्तीय सहयोग देने के लिए एआईआईएफबी बैंक के साथ महावितरण ने समझौता किया। गिनीज विरीक्षक के अनुसार रिकॉर्ड के लिए 35,000 पंपों की आवश्यकता थी, पर महाराष्ट्र ने 45,911 पंप स्थापित कर रिकॉर्ड को पीछे छोड़ दिया।

फीडरों को सौर ऊर्जा पर लाने का फैसला

मुख्यमंत्री फडणवीस ने कहा कि पहले किसानों की मांग थी कि दिन में बिजली मिले, पर बिजली की कमी के चलते कठिनाई होती थी। फीडरों को सौर ऊर्जा पर लाने का निर्णय इसी कारण लिया गया।

- उन्होंने बताया कि अब तक 7 लाख सौर पंप महाराष्ट्र में स्थापित किए गए हैं। अगले वर्ष 10 लाख सौर पंपों का लक्ष्य है।



प्रतीक्षा अवधि कम की गई

महावितरण कर्मचारियों के प्रयासों से विश्वविक्रम संभव हुआ है।केंद्र सरकार ने भी इस मॉडल को सराहते हुए अन्य राज्यों को अपनाने की सलाह दी है।

16,000 मेगावाट स्वच्छ बिजली से दरों में कटौती

मुख्यमंत्री ने कहा कि सौर ऊर्जा प्रदूषण-रहित है और उत्पादन लागत कम है। इसी आधार पर हर साल अन्य उपभोक्ताओं के लिए बिजली दरों में 3% कमी की जाएगी। सौर उपकरण निर्माण, विकेलाओं, तकनीशियन व स्वसहाय कर्मचारियों सहित लगभग एक लाख लोगों को रोजगार मिल है। यह योजन ऊर्जा क्षेत्र में नई दिशा देने वाली साबित होगी।

कार्यक्रम में यह भी उपस्थित थे :

ऊर्जा मंत्री आतुल सावे, राज्यमंत्री मेघना साकोरे बोर्डीकर, विधायक संजय केणेकर, अतुराया चव्हाण, नारायण कुचे, प्रशांत बंब, सुरेश धस, प्रवीण परदेशी, आभा शुक्ला, लोकेश चंद्र, आदित्य जीवने, विश्वास पाठक, सचिन तालेवार, राजेंद्र पवार, धनंजय औंधेकर, पवनकुमार कांबोट तथा अभिनेता संदीप पाठक आदि मान्यवर उपस्थित रहे।

मराठवाड़ा का बड़ा योगदान

मुख्यमंत्री ने बताया कि सौर योजना के क्रियान्वयन में मराठवाड़ा अग्रणी रहा है।छत्रपति संभाजीनगर जिले में 14,000 पंप लगाए गए। नदी जोड़ परियोजना से सूखा-सुक्त की दिशा में कार्य, नानासाहेब देशमुख कृषि संजीवनी योजना से किसानों को पृथक सुविधाएं दी गईं। उन्होंने कहा कि खेती को टिकाऊ बनाने तक सरकार किसानों के साथ खड़ी रहेगी।

योजना में मराठवाड़ा ने बनाया रिकॉर्ड

मांगने पर सभी को सोलार कृषिपंप योजना में महाराष्ट्र ने विश्व रिकॉर्ड बनाया है। महावितरण ने एक ही महीने में 45 हजार 911 सोलार कृषिपंप लगाने का विश्व स्तर का रिकॉर्ड किया है। इसमें मराठवाड़ा में 26 हजार 721 सोलार कृषिपंप लगाकर नया रिकॉर्ड बनाया है। राज्य की कुल आकड़ेवारी 60 फीसद हिस्सा छत्रपति संभाजीनगर प्रादेशिक कार्यालय के तहत छत्रपति संभाजीनगर, लातूर व नांदेड परिमंडल में 8 जिले हैं। जिसे गिनिज बुक में दर्ज किया गया है। मुख्यमंत्री देवेंद्र फडणवीस की प्रमुख उपस्थिती में शुक्रवार को गिनिज बुक की ओर से विश्वविक्रम प्रमाणपत्र प्रधान सभरोह संपन्न हुआ।

- किसानो को केवल 10 फीसद रकम अदा करके सोलार पैनल्स और कृषिपंप का पूरा सेट मांगने पर उसे सोलार कृषिपंप योजना में महाराष्ट्र ने बढ़त बनाई है। इसमें विशेष तौर पर छत्रपति संभाजीनगर प्रादेशिक कार्यालय के तहत एक महीने में 26 हजार 721 सोलार कृषिपंप लगाकर रिकार्ड बनाया है। इसके लिए महावितरण के अध्यक्ष व व्यवस्थापकीय संचालक लोकेश चंद्र, सहव्यवस्थापकीय संचालक आदित्य जीवने ने क्षेत्रिय कार्यालय के अभियंता व सोलार कृषिपंप लगाने वाले वेंडर से तालमेल रखकर लगातार प्रयास करके आवश्यक सूचना दी। किसानों ने सोलार कृषिपंप की मांग करने के बाद कर्मचारियों ने सोलार कृषि की मांग करने के बाद कर्मचारियों ने सोलार कृषिपंप लगाने के लिए तत्काल स्थल का मुआयना करके सोलार कृषिपंप लगाने में हो रही विचकत का निपटारा करने के संबंध में सूचना दी। इस कारण मराठवाड़ा ने मांगने पर उसे सोलार कृषिपंप योजना में नया रिकॉर्ड बनाया।

कहां, कितने पंप

जिला	सौर कृषिपंप
छत्रपती संभाजीनगर	3102
जालना	6958
छत्रपती संभाजीनगर परिमंडल	10060
नांदेड	975
परभणी	3182
हिंगोली	2100
नांदेड परिमंडल	6257
लातूर	900
बीड	7467
धाराशिव	2037
लातूर परिमंडल	10404
मराठवाडा	26721



दैनिक भास्कर
Sat, 06 December 2025
https://epaper.bhaskarhindi.com/c/78681018

Image 3.16 Marathi press coverage of the MTSKPY certification ceremony

ePaper
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1 महीने में 45,911 सोलर पंप

एतिहासिक उपलब्धि, 'गिनीज वर्ल्ड रिकॉर्ड' में नाम दर्ज

■ मुंबई, नवभारत न्यूज नेटवर्क. महाराष्ट्र में देवेंद्र फडणवीस के नेतृत्व वाली महायुति सरकार ने एक साल पूरा होने पर एक ऐतिहासिक उपलब्धि हासिल की है. मुख्यमंत्री फडणवीस ने छत्रपति संभाजीनगर में जनता को संबोधित करते हुए घोषणा की है कि महाराष्ट्र ने केवल एक महीने में 45,911 सोलर पंप लगाकर 'गिनीज वर्ल्ड रिकॉर्ड' में अपना नाम दर्ज करा लिया है. एक जनसभा को संबोधित करते हुए सीएम देवेंद्र ने कहा कि जनता के विश्वास से महाराष्ट्र तेज गति से प्रगति कर रहा है. उन्होंने कहा कि 2014 में जब वे पहली बार मुख्यमंत्री बने, तब किसानों की सबसे बड़ी मांग पानी और बीज की उपलब्धता थी. मराठवाड़ा के किसानों की समस्याओं को देखते हुए 1 लाख सौर पंप योजना शुरू की गई थी. बीच में कुछ समय यह योजना ठप रही, लेकिन 2022 में महायुती सरकार के सत्ता में आने के बाद केंद्र सरकार की कुसुम योजना के सहयोग से इसे फिर से गति दी गई.

देश में नंबर 1 पर पहुंचा महाराष्ट्र राज्य



मुख्यमंत्री फडणवीस ने कहा कि महावितरण के प्रयासों से देशभर में जितने सोलर पंप लगाए गए हैं, उनमें से 65 प्रतिशत अकेले महाराष्ट्र में लगाए गए हैं. इस कारण महाराष्ट्र इस क्षेत्र में देश में नंबर 1 पर पहुंच गया है. मुख्यमंत्री ने कहा कि विरोधियों की आलोचनाओं के बावजूद यह बड़ी उपलब्धि हासिल की गई है. उन्होंने कार्यक्रम में उपस्थित गिनीज वर्ल्ड रिकॉर्ड के अधिकारियों का भी धन्यवाद किया.

Image 3.17 Hindi press coverage of 45,911 solar pump installations in one month

Rajasthan case study

4.1 State demographics

Rajasthan, India's largest state by geographical area, is predominantly rural and agrarian in character. With an estimated population exceeding 80 million, nearly 73% of its people live in rural areas, and agriculture remains the primary livelihood for more than half of the workforce. The state falls largely within arid and semi arid climatic zones, with low and erratic rainfall and chronic water stress.

Agricultural productivity is therefore heavily dependent on groundwater extraction through electric pump sets, making electricity supply a critical input for the rural economy. The dispersed settlement pattern, low population density, and long distribution network lengths pose particular challenges for reliable power supply and financial sustainability of electricity distribution.



Figure 4.1 Rajasthan, location within India



1. Solar landscape

Rajasthan is one of India's most promising regions for solar energy development, owing to its exceptional natural advantages. The state has the highest number of sunny days in the country, at around **325 days** of sunshine a year, which delivers consistent generation throughout the year. It also benefits from high solar radiation of about 5.72 kWh/m^2 a day, making it highly efficient for solar power production.

In addition, Rajasthan has abundant available, some 33,000 square kilometres, providing ample space for large-scale solar installations and infrastructure. These conditions give the state a solar power potential of around 142 GW, making it a key hub for renewable energy growth and a major contributor to India's clean energy transition.

These demographic and geographic realities have shaped Rajasthan's approach toward decentralised solar energy as a structural reform in agricultural power supply.

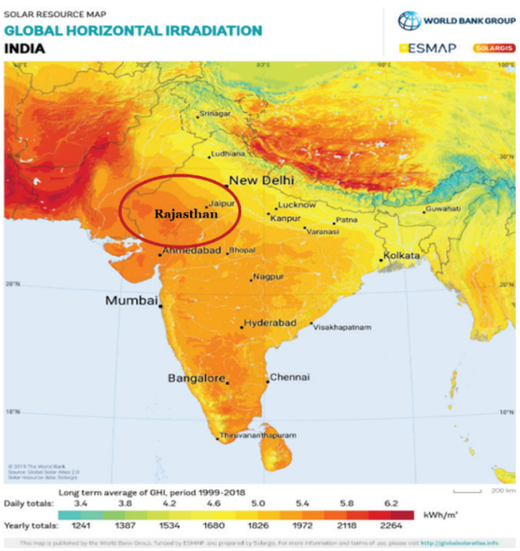


Figure 4.2 Global horizontal irradiation, India

2. Dependency on Electricity Consumption

Rajasthan faces acute water shortage. Over the last 100 years, on average, almost every district in the state has experienced drought of one kind or another for half the time. The state has very little surface water irrigation potential, so ground water is the main source of irrigation.

A comparison of water level in Rajasthan with other states shows that groundwater has fallen far lower than in other states.

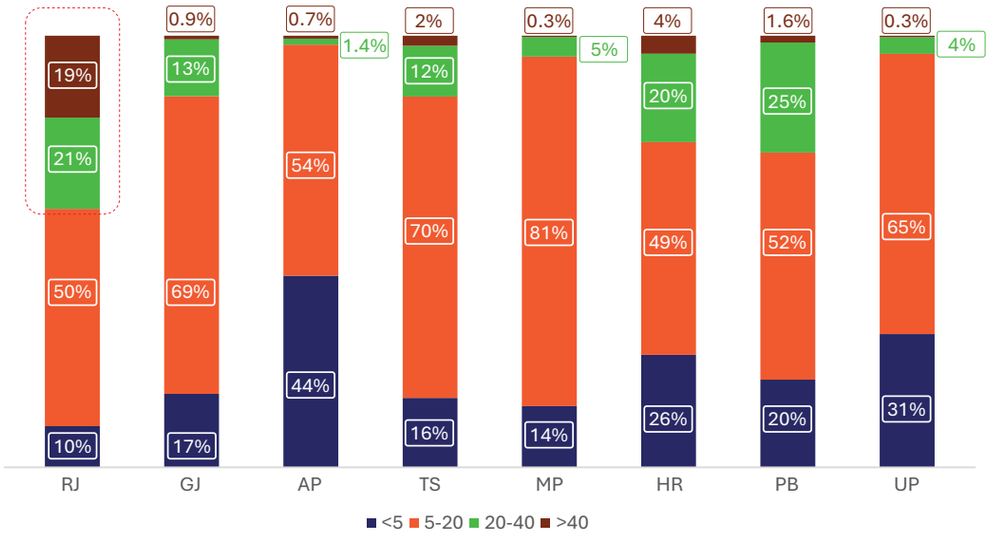


Figure 4.3 Groundwater level below ground level as a share of pumps, by state

More than 40% of wells in Rajasthan have depleted to more than 20 m below ground level, well above other states. Dependence on electricity consumption is therefore higher in the state, as shown below.

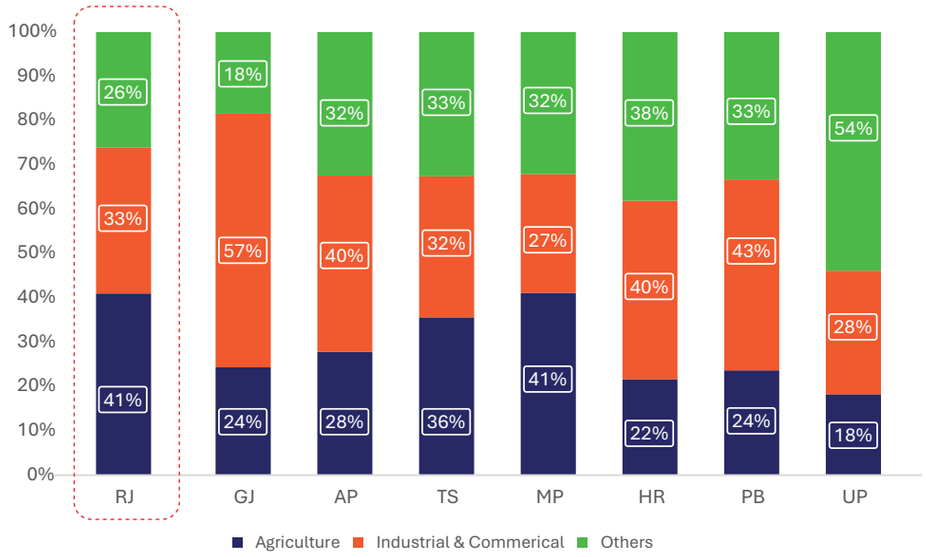


Figure 4.4 Energy consumption mix by consumer category, by state

4.2 Historical barriers to solar growth

Prior to large-scale solarisation, Rajasthan's agricultural power ecosystem faced several challenges, among them unreliable night-time supply, high technical and commercial losses, higher average variable power purchase cost, non-cost reflective nature of agriculture tariffs, a rising tariff subsidy burden.

The DISCOMs also struggled with peak load pressures during agricultural supply hours, poor voltage quality at feeder tails, land availability near 33/11 kV substations, tariff viability for developers and slow progress with pump-level solarisation. Coordination across agencies proved difficult during the early implementation phases of feeder solarisation. The key issues follow.

1. High subsidy burden

The Government of Rajasthan provides tariff subsidy to agricultural consumers in the state. The scale of that subsidy is the state government's principal concern. Since the water table falls every year through over-exploitation and non-replenishment of groundwater, electricity consumption for agriculture has been rising, and the subsidy burden with it. Further, any tariff hike, whenever approved, has been borne by the government, with no impact passed on to farmers in the last 10 years. The trend in subsidy burden on the state government is shown below.

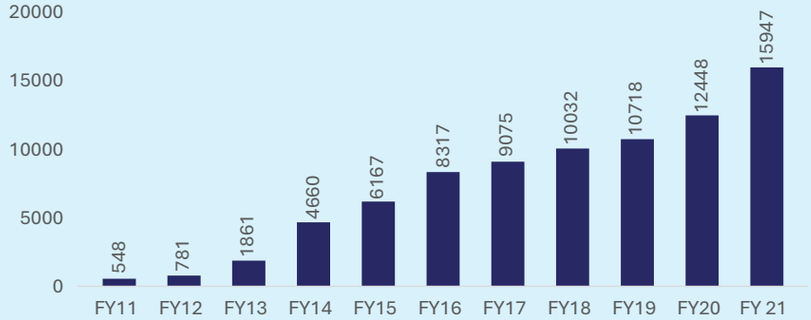


Figure 4.5 Trend in agricultural tariff subsidy burden on the Government of Rajasthan, FY11 to FY21

2. Non-cost-reflective tariff in agriculture category

The tariffs for agriculture category are invariably set lower than the average cost of supply (ACoS) approved by the Rajasthan Electricity Regulatory Commission (RERC). The difference is recovered from industrial and commercial consumers, known as the subsidising categories. The cost coverage ratio of the agriculture category, defined as total agriculture category revenue including subsidy as a percentage of the DISCOMs' average cost of supply, is shown below.

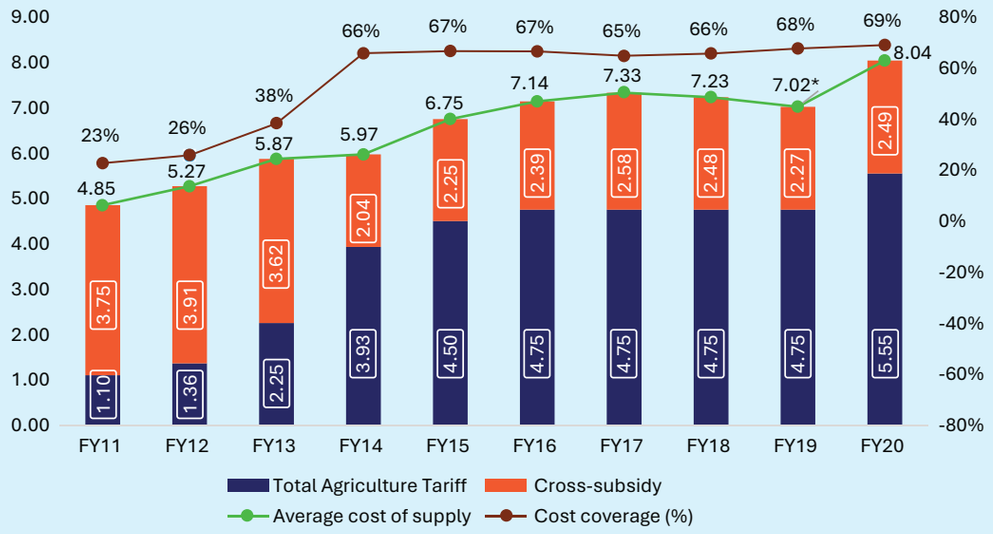


Figure 4.6 Cost coverage and cross-subsidy levels in agriculture tariffs, FY11 to FY20

Cost coverage of the agriculture tariff, including subsidy, has improved since FY11, though agriculture tariffs still stand at only 66% to 69% of the cost of supply. Under the National Tariff Policy, tariffs should sit within plus or minus 20% of the average cost of supply.

The DISCOMs are therefore unable to recover the full cost of supply from the agriculture category, and the shortfall is loaded onto the non-domestic and industrial categories, driving tariffs for those categories significantly higher.

3. Impact of insufficient subsidy release by the Government of Rajasthan

The total tariff for the agriculture category, at ₹5.55 a unit, as determined by the RERC, falls short of the cost of supply at ₹8.04 a unit. Shortfalls in subsidy from the state government then leave the DISCOMs unable to realise even the cross-subsidised tariff.

The present rate of recovery from the agriculture category, based on subsidy realised from the state government, runs at ₹4.00 to ₹4.50 a unit. Cost recovery from agricultural consumers is therefore squeezed twice over.

As discussed earlier, state government of ₹17,458 crore up to 31 March 2021. That unpaid subsidy amounts to nearly 12% of the DISCOMs' revenue, as shown below.

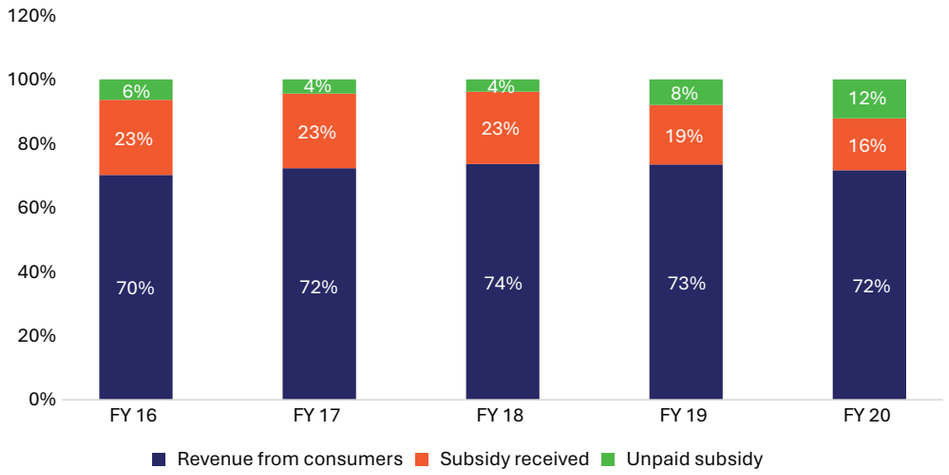


Figure 4.7 Revenue mix of the Rajasthan DISCOMs, FY16 to FY20

The shortfall has weakened the financial position of the DISCOMs. The cash crunch forced them to defer payments to power generators. Outstanding dues reached ₹33,443 crore as of 31 January 2022, among the highest in the country. These dues also attract a late payment surcharge (LPS) of 15% to 18% for central public sector undertakings and 12% for Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUNL).

Nearly 74% of such dues are owed to RVUNL, which has placed considerable strain on the financial position of the generation company as well.

4. Slow progress under Component C, pump-level solarisation

In Rajasthan, agriculture consumers get receive electricity at a highly subsidised tariff of only 90 paise a unit, and more than 500,000 farmers out of a total of 1.5 million receive a zero bill, through additional subsidy provided by the Government of Rajasthan.

Farmers are therefore reluctant to pay their 10% share upfront to the DISCOMs, even after repeated follow-up, which delays implementation. Progress so far has been confined to tribal sub-plan areas. A further constraint is that 60% of the agriculture pumps exceed 7.5 horsepower (HP), so the 7.5 HP cap on CFA eligibility excludes the majority of farmers.

5. Block-hours power supply to farmers at night

Since the DISCOMS provide block-hours supply to farmers for about six hours daily on a rotational basis, many farmers receive power at night, which causes them considerable inconvenience.



Image 4.1 Solar-powered agricultural pump in operation, Rajasthan

4.3 Objective

The Government of Rajasthan positioned solarisation of agriculture as a strategic intervention to secure energy security, farmer welfare and DISCOM sustainability together.

The core objectives were to ensure reliable daytime electricity supply for agricultural consumers, reduce dependence on conventional power sources, lower the subsidy burden on DISCOMs and draw on Rajasthan's solar potential.

By integrating feeder-level solar power generation, the state set out to create a long-term, low-cost, clean energy pipeline dedicated to agriculture and to the wider rural economy.

4.4 Decentralised target

Rajasthan has emerged as one of the national leaders under PM-KUSUM Components A and C, with MNRE approving around 5,618 MW under Component A and the solarisation of 400,000 agricultural pumps, around 5,400 MW, under Component C.

The proposed decentralised solarisation programme in Rajasthan provides for around 17,000 MW of solar capacity across 6,560 solar photovoltaic (SPV) plants, benefiting more than 1.4 million agricultural consumers connected to around 5,000 33/11 kV substations under the three distribution companies, Jaipur Vidyut Vitaran Nigam Limited (JVVNL), Ajmer Vidyut Vitaran Nigam Limited (AVVNL) and Jodhpur Vidyut Vitaran Nigam Limited (JdVVNL), in a statewide, balanced rollout.



Image 4.2 Feeder-level solar plant, Rajasthan

The initiative provides reliable daytime power for agriculture, reduces dependence on conventional energy sources, lowers subsidy burdens on DISCOMs and strengthens farmers' income stability through clean, decentralised solar energy. The long-term vision extends beyond capacity addition to full conversion of agriculture feeders to solar-backed daytime supply.

4.5 Pathway to achieve the target

Rajasthan has made considerable progress on decentralised solar power installations, guided by the targets allocated by MNRE. With a strong policy push and proactive participation from the state DISCOMs, implementation has gathered momentum.

Schemes aimed at promoting rooftop solar and distributed generation are rolling out steadily, supported by streamlined processes and stakeholder engagement. The DISCOMs have been facilitating installations, building consumer awareness and strengthening grid readiness, contributing steadily towards the assigned targets and confirming Rajasthan's position as a frontrunner in renewable energy adoption.

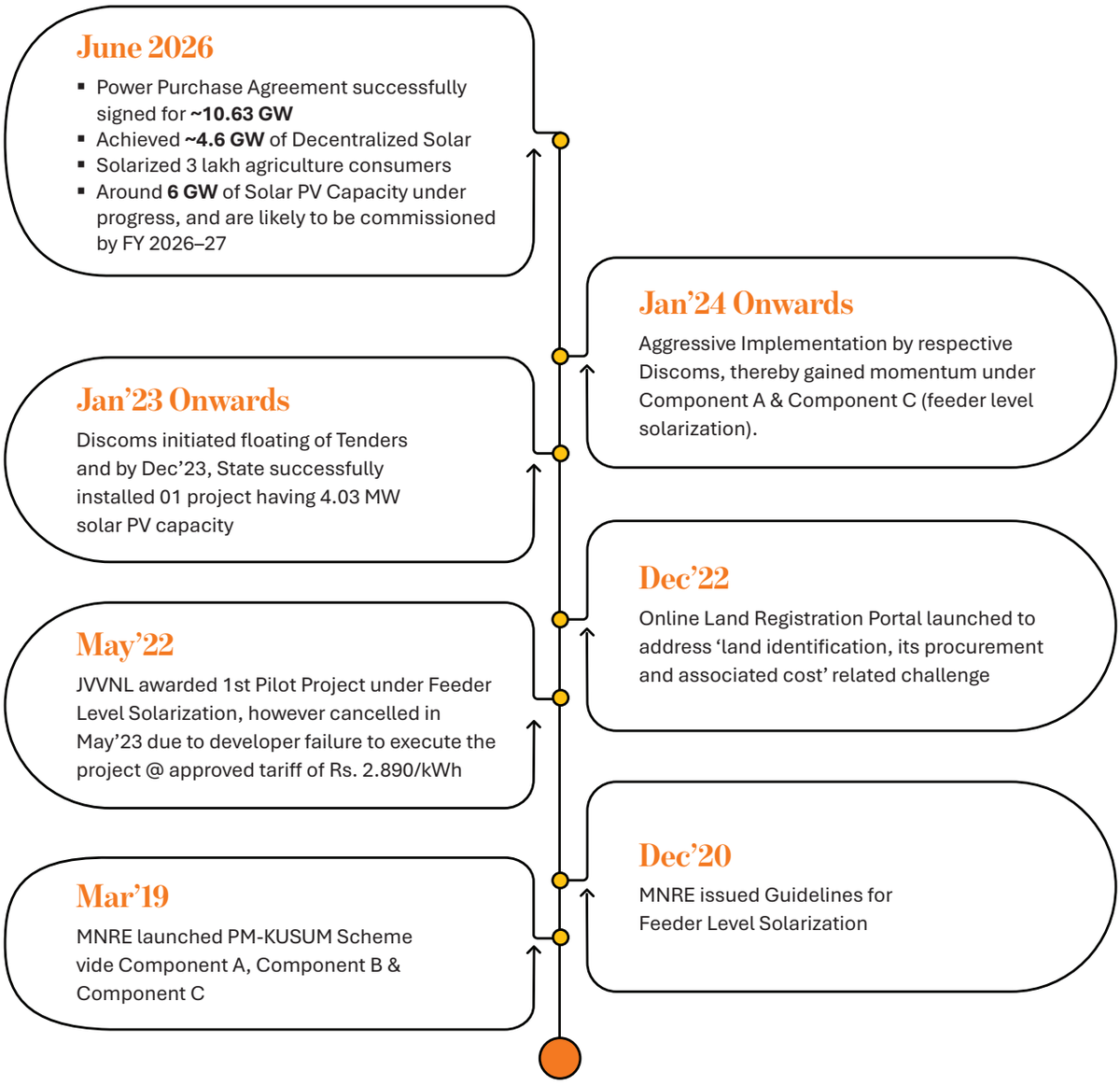


Figure 4.8 Rajasthan solarisation journey, FY18-19 to FY26-27

Rajasthan, the journey so far

Rajasthan's journey towards decentralised solar power development has evolved steadily since the launch of the PM-KUSUM Scheme by the MNRE in March 2019, covering Components A, B, and C. That was the foundational step for promoting distributed renewable energy solutions, particularly pump-level solarisation under Component C. In December 2020, MNRE issued detailed guidelines for feeder-level solarisation, giving states a structured framework to put decentralised solar initiatives into effect.

In the initial implementation phase, JVVNL ran the pilot, awarding its first project under feeder-level solarisation in May 2022. The project was later cancelled, owing to execution difficulties at the developer end, and it yielded learnings that shaped every implementation approach that followed. Around the same time, Rajasthan ran into difficulties in land identification, procurement and associated costs. To address these bottlenecks, the state introduced an online land registration portal in December 2022, which opened up land availability and improved transparency in procurement.

From January 2023 onwards, accelerated the rollout by floating tenders for decentralised solar projects. Initial projects followed, including one of **4.03 MW** commissioned in December 2023. Building on that momentum, the pace quickened from January 2024, with the DISCOMs driving installations under

Components A and C, with a focus on agriculture feeder solarisation.

By June 2026, power purchase agreements (PPAs) have been successfully signed for around **10.63 GW,** a strong pipeline. The state has reached around **4.6 GW** of decentralised solar capacity and solarised supply for around **300,000** agricultural consumers. A further **6 GW** of solar PV capacity is at various stages of implementation and is expected to be commissioned by FY27. The trajectory carries Rajasthan from initial policy adoption and pilot difficulties to large-scale execution and makes the state a key contributor to MNRE's decentralised solar targets.

4.6 The Rajasthan framework

Rajasthan adopted a **blended top down and bottom up approach** to successfully enable large scale implementation of agriculture feeder solarisation. At the policy level, the state and the DISCOMs aligned the programme framework strictly with MNRE guidelines and with the Rajasthan Integrated Clean Energy Policy 2024, securing regulatory consistency and investor confidence. The state engaged the RERC through timely filing of petitions for approval of pre-fixed or discovered levelised tariffs, as applicable.

Top-down clarity on policy, tariff and viability de-risked projects and accelerated private participation. In parallel, **standardised and simple** eligibility and qualification criteria were developed for interested participants, including farmers, groups of farmers, individuals, cooperatives, farmer producer organisations and private developers, reducing procedural complexity and securing uniform adoption across JVVNL, AVVNL, and JdVVNL. Complementing this, a strong bottom up implementation strategy focused on stakeholder readiness and field level execution. DISCOMs carried out **extensive consumer awareness programmes** using print and digital media to educate interested parties on the benefits of feeder solarisation, daytime power availability, and long term sustainability.

Structured capacity building and training programmes were conducted for DISCOM officials to strengthen technical, commercial, and project management capabilities. Dedicated coordination mechanisms closed the gaps among multiple stakeholders including DISCOMs, developers, regulators, and financial institutions, enabling faster approvals and smoother execution.

The integrated approach, combining policy certainty, regulatory facilitation, institutional capacity and grassroots awareness, has been central to Rajasthan's ability to scale agriculture feeder solarisation into one of the largest decentralised solar programmes in the country.

4.7 Best practices adopted

1. Implementation mode

Rajasthan adopted the **Renewable Energy Service Company (RESCO) model** for agriculture feeder-level solarisation under PM-KUSUM Components A and C. Under this approach, developers invest in, build, operate and maintain solar power plants for 25 years, with DISCOMs purchasing power at a discovered levelised tariff. The RESCO model reduced upfront fiscal pressure on DISCOMs, transferred performance risk to developers, and enabled rapid scaling through competitive bidding.

2. Capacity assessment and sizing

Solar plant capacity was determined from the historical energy consumption of agricultural feeders, aligned with MNRE guidelines.

Plants were sized to meet 100% of the feeder's annual energy requirement, securing maximum use without over-injection. **CUF benchmarks of 17% under Component A and 19% under Component C for feeder level solarisation** were factored into the sizing methodology.

The steps JVVNL follows for project sizing are set out below.

- On 4 December 2020, MNRE issued guidelines for implementation of feeder level solarisation under Component C of the PM-KUSUM scheme. Under the scheme, segregated agriculture feeders can be solarised using solar PV power plant installation either through CAPEX mode or RESCO mode. As per the guidelines, the SPV plant shall have:
  i. Capacity calculated based on the total annual power requirement of the feeder with no cap on the capacity.
  ii. To cater to the power requirement for a single feeder or for multiple agriculture feeders emanating from a substation.
  iii. To feed power at 11 kV or at the higher voltage level side of the substation depending on factors such as land availability and technical feasibility.
- MNRE later issued comprehensive guidelines for implementation of PM-KUSUM Scheme with similar provisions as mentioned below:
  i. The existing load of the feeder will be assessed and a solar power plant of capacity that can cater to the requirement of annual power for that agriculture feeder can be installed either through CAPEX mode or RESCO mode, which will supply solar power to that feeder.

     For example, a feeder with an annual power requirement of 1 million units can be supplied by a solar power plant of around 600 kW with an annual CUF of 19%.
  ii. Average of consumption of last three years shall be considered for calculating the solar plant capacity as per calculations in Para i) above.
  iii. Mixed feeders can also be solarised, though MNRE CFA will be available based on capacity required for agriculture consumption.
  iv. Solarisation of pumps of any capacity is allowed, though for pumps above 7.5 HP, the CFA will be limited to solar capacity for 7.5 HP pumps.
  v. For calculating consumption for pumps of capacity higher than 7.5 HP or 15 HP, average consumption of 7.5 HP/15 HP pumps on the same feeder may be considered. This average consumption may be used in estimating consumption for all pumps of capacity higher than 7.5 HP/15 HP.
  vi. The state may choose to install feeder level solar power plant of capacity higher than capacity required for supplying power to agriculture feeder. However, in this case CFA will be limited for solar capacity required for supplying power to the agriculture feeder.
- Sample calculations under the December 2020 guideline, for determining solar PV capacity and eligible CFA under agriculture feeder solarisation, are given in Table 4.1.

Table 4.1 Sample calculation of solar PV capacity and eligible CFA for an agricultural feeder

Parameter	Formula	Unit	Input	Remarks
Agriculture pump capacity	A	HP	10	For a single consumer
Units consumed, year 1	B	kWh	2,900	Actual consumption over the past three years
Units consumed, year 2	C	kWh	6,163	
Units consumed, year 3	D	kWh	12,558	
Units taken for sizing	D	kWh	12,558	Most recent year's consumption
SPV capacity under Component C (FLS)	E = D / (365 × 24 × 19%)	kW	7.55	At a CUF of 19%
Units capped at 7.5 HP	F = (7.5 / A) × D	kWh	9,419	Unitary method, or three-year average, for computing eligible CFA
Capped SPV capacity	G = F / (365 × 24 × 19%)	kW	3.25	
Capped eligible CFA	H = (G / 1000) × 1.05	₹ crore	0.0034, or ₹34,000	At CFA of ₹1.05 crore per MW

- MNRE subsequently amended the guidelines through an office memorandum dated 18 November 2024, revising the earlier provision to read

The existing load of the feeder will be assessed and a solar power plant of capacity that can cater to the requirement of peak power for that agriculture feeder can be installed either through CAPEX mode or RESCO mode, which will supply solar power to that feeder.

The DISCOMs floated tenders for agricultural feeder solarisation on an individual project basis. They also explored cluster-wise tendering in line with MNRE guidelines, though these did not attract significant bidder participation, largely because of the difficulty of securing sufficient contiguous land for entire project clusters within a single lot.

To ensure smoother implementation and better market response, the DISCOMs continued with individual project tenders.

3. Interconnection and evacuation

The interconnection was designed at either 11 kV or 33 kV, depending on feeder configuration, substation capacity and technical capability.

- **SPV up to 2.55 MW, connected at the 11 kV side**
- **SPV above 2.55 MW, connected at the 33 kV side**

Solar plants were generally located close to, preferably within 5 km of, distribution 33/11 kV substations, to minimise evacuation losses and right-of-way constraints. Developers were responsible for constructing evacuation lines and protection systems up to the designated interconnection point. This decentralised architecture strengthened local grids and reduced dependence on upstream transmission infrastructure.

4. Online land registration portal

Rajasthan DISCOMs, drawing on the state's experience with PM-KUSUM Component A and one pilot project under Component C, observed that solar power project developers face difficulty in identifying and procuring suitable land, particularly developers and investors from outside Rajasthan, for whom land availability and cost are uncertain.

Land identification, procurement and cost are therefore the most critical factors in setting up solar power projects.

To address this, the Energy Minister, Government of Rajasthan, launched a dedicated platform for farmers, landowners and solar power developers, to resolve the land question and to accelerate decentralised distributed solar generation under PM-KUSUM Component C, aligned with MNRE guidelines.

The portal acts as a facilitating platform where farmers, landowners and developers can collaborate to arrange land for a solar power plant near identified 33/11 kV substations. The DISCOMs then float tenders for interested bidders.

The salient features of the portal are set out below.

- Farmers, landowners, developers and DISCOM officials each hold their **own login credentials** and can review application status.
- All identified 33/11 kV substations are pre-loaded, with the number of agricultural consumers, solar power capacity in MW, land parcel required in hectares and approximate eligible CFA in ₹ crore, so that farmers, landowners and developers can review the proposed location before making any online payments during registration.
- **GPS** coordinates are provided, so that farmers, landowners and developers can view the exact longitude and latitude of the proposed locations.

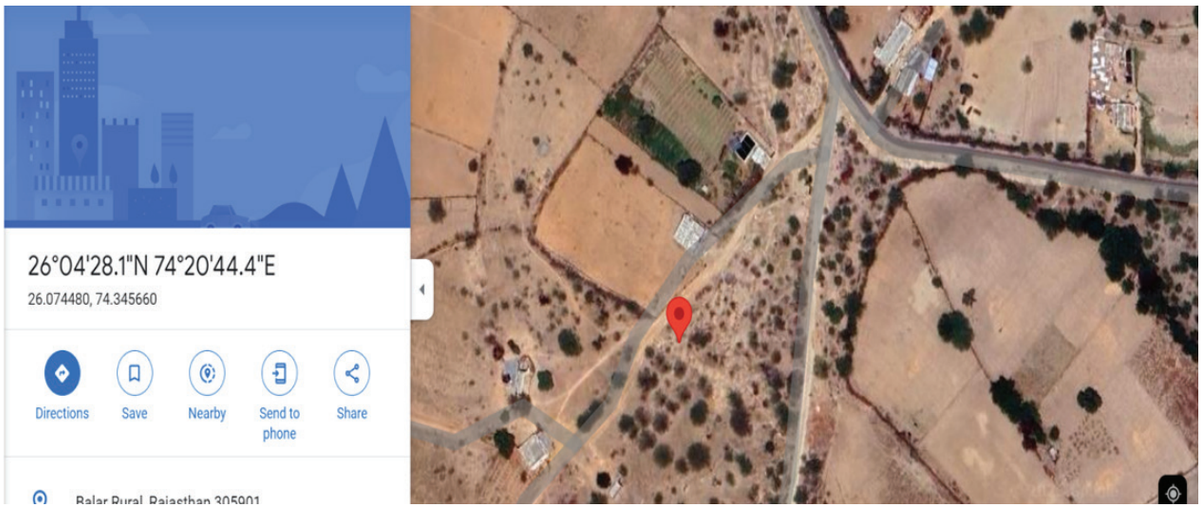


Figure 4.9 Geo-tagged land verification during joint site survey

- Detailed procedural guidelines for the scheme are published on the portal for farmers, landowners, developers and other stakeholders.
- A notice board carries the latest news for each DISCOM, alongside a set of frequently asked questions.
- A grievance redressal mechanism, working through email, telephone and dedicated toll-free call centres, registers grievances, complaints, queries and suggestions about the scheme.
- A survey of the land and other credentials is carried out jointly by the DISCOM field office and the applicant or their authorised representative, in a prescribed format, verifying the following.
  - GPS coordinates of land
  - Route distance of land from the 33/11 kV substation
  - Distance between various land parcels registered as a single pocket by the applicant
  - Photographs of land
  - Preparation of a tentative single line diagram for the connecting line to the substation
  - Availability of space or bay at the DISCOM's receiving substation
  - Any river crossing or large trees on the land.
- Applicants upload supporting documents, including the Jamabandi, Aadhaar card, a cancelled bank cheque or passbook copy and a photograph of the applicant or authorised person. These confirm ownership and reveal any litigation or dispute before the lease agreement is executed.
- Indicative annual lease rent runs from ₹80,000 to ₹160,000 per hectare, escalating 5% every two years, and applies for an initial 26 years inclusive of the 25-year PPA, as set out in Table 4.2.

Table 4.2 Prevailing DLC land rate and indicative annual lease rent

Prevailing DLC rate of land at the time of registration (₹ per hectare)	Indicative annual lease rent (₹ per hectare)
Up to 800,000	80,000
Above 800,000 and up to 1,200,000	100,000
Above 1,200,000 and up to 2,000,000	140,000
Above 2,000,000	160,000
Lease rent escalates by 5% every two years, and applies for an initial period of 26 years, inclusive of the 25-year PPA duration.	

The portal did, however, limit the scheme's scalability, since in the early phases tenders could be floated only against land already offered on it.

Extensive information, education and communication activity, together with the successful implementation of the initial MNRE sanctions under Component C, **gave the scheme momentum** from January 2024. The Energy Department then set a more ambitious target to meet the PM-KUSUM deadline of March 2026, since extended to March 2027, and tenders were floated in large volumes under Components A and C.

DISCOMs may redesign such portals as requirements change, and other DISCOMs may adopt the model.

Role played by the DISCOMs

- Joint survey of registered land by designated officer in presence of applicant verifying and capturing the following.
  - Land details, covering location, size, type and ownership, together with the documentary proofs submitted by the applicant
  - GPS coordinates of land
  - Route distance of the land from the substation
  - Distance between various land parcels registered as a single pocket by the applicant
  - Photographs of the land
  - A tentative single line diagram for the connecting line to the substation
  - Availability of space or bay at the DISCOM's receiving substation
  - Any river crossing or large trees on the land.
  - Lease rent is paid to the farmer, landowner or authorised person only after the plant is commissioned.
- Payment to the developer against energy supplied from the commissioned solar PV plant, after deducting the annual lease rent payable to the landowner.
- The application flow the DISCOM follows is set out in Figure 4.10.

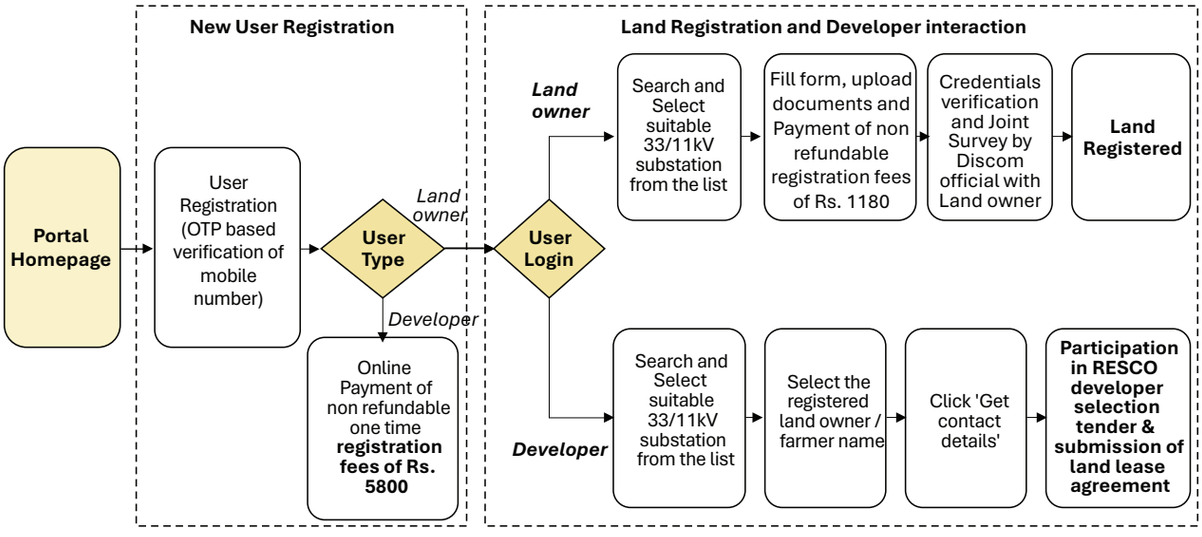


Figure 4.10 Application, registration and developer interaction flow on the Rajasthan portal

5. Metering and accounting

Rajasthan adopted gross metering arrangements for feeder-level plants, supported by availability-based tariff (ABT) compliant, remotely monitored meters. Joint meter reading protocols and online data sharing secured transparency in energy accounting. Remote monitoring systems (RMS) give the DISCOMs real-time performance tracking.

Treatment of energy generated

Subject to the terms and conditions of the Power Purchase Agreement (PPA), the solar power developers undertake to sell to Rajasthan Urja Vikas and IT Services Limited (RUVITL) (on behalf of DISCOMs) and RUVITL undertakes to pay tariff **(in terms of ₹ per kWh)** for all the energy supplied at the delivery point corresponding to the contracted capacity. Relevant provisions made for ensuring grid stability and accountability are as highlighted below:

- The DISCOMs are under no obligation, in any contract year, to purchase any additional energy from the developer beyond the contract capacity.
- In any contract year other than the first year of operation, a developer that fails to generate the minimum energy in million units corresponding to a 19% minimum CUF, for reasons solely attributable to the developer, becomes liable to pay compensation.
- Any excess generation up to the contracted capacity in MW (AC) will be purchased at the contracted levelised tariff for 25 years, subject to the other terms of the tender, work order and agreement.
- Compensation applies to the shortfall in generation during the contract year, at a rate determined by RERC, set so that RUVITL is made whole on all costs arising from low generation and supply under the PPA. The minimum compensation payable to RUVITL shall be 25% of the cost of the shortfall in energy terms, calculated at the PPA tariff. Compensation does not apply in the event of force majeure as identified under the PPA.
- Where peak capacity exceeds the contracted capacity and disturbs the system at the injection point, the developer must forgo the excess generation and reduce output to the contracted capacity.
- The developer shall install adequate protection equipment at the interconnection point to avoid excess energy feeding into the grid. Where that equipment is absent, the DISCOMs may withhold payment for any energy above the contracted capacity.

6. Payment security mechanism

Rajasthan adopted the **letter of credit (LC)** framework as its principal means of securing timely payment to solar power developers. RUVITL and the DISCOMs open and maintain an irrevocable LC equivalent to a stipulated billing cycle, which developers can invoke against payment delay, strengthening bankability and investor confidence.

Escrow arrangements have also been built in to ring-fence specific revenue streams of the DISCOMs, so that funds are earmarked for payments to developers on priority. Together, the LC-backed payment security and escrow mechanisms mitigate counterparty risk, improve financial discipline and ease implementation of agricultural feeder solarisation projects.

7. Power purchase and tariff

Tariffs were discovered through transparent competitive bidding and approved by the RERC.

- **Section 62 of the Electricity Act 2003 governs determination of the pre-fixed levelised tariff under Component A**
- **Section 63 of the Electricity Act 2003 governs determination of the levelised tariff under Component C for feeder level solarisation**

With the adoption of a ceiling tariff of **₹3.55 per kWh** by RERC, levelised tariffs typically ran between ₹2.50 and ₹3.55 per kWh, setting aside a few exceptionally low bids. That is well below the effective cost of conventional agricultural power supply. Early tariffs sat at the higher end, and wider stakeholder participation brought them down year on year. The average levelised tariff now stands at around **₹3.00 per kWh, below the DISCOMs' average variable power purchase cost of around ₹3.32 per kWh and their average power purchase cost of around ₹4.85 per kWh, as per the latest tariff order for FY26.** Long-term PPAs of 25 years provided revenue certainty to developers and price stability to DISCOMs.

8. Mitigating coordination gaps

Through a structured and multi-level engagement approach, DISCOMs closed coordination gaps among stakeholders in the implementation of the PM-KUSUM scheme.

The Energy Department, Government of Rajasthan, coordinated with MNRE to secure **additional sanctions**, ensuring adequate project allocation and continuity in execution.

The scheme was positioned as a flagship initiative of the state, receiving high-level monitoring and priority attention, which strengthened inter-departmental alignment.

Regular consultations and meetings were held with farmers, landowners, banks and developers, to address design and development challenges in good time. Close coordination with District Collectors and local administrations eased ground-level execution, speeding approvals, resolving local issues, particularly on right of way, and securing stakeholder alignment, which substantially reduced implementation bottlenecks. This work included the following.

- Directives to District Collectors, followed by repeated meetings, to prioritise and address right of way issues faced by successful solar power developers.
- Support to solar power developers through DISCOM field officials, local administration and, where needed, the police.
- Regular meetings with banks, financial institutions and solar power developers.
- A coordinated approach to resolving bottlenecks and expediting loan processing.

9. Information, education and communication activities

IEC campaigns were central to farmer participation. Rajasthan ran awareness drives at circle, division and sub-division level, along with DISCOM-led consultations. These built trust, clarified land leasing arrangements and set out the long-term income benefits for farmers. Further work by the DISCOMs is set out below.

- Infographics

  DISCOMs developed simple, visually engaging infographics to explain key aspects of the PM-KUSUM scheme, including eligibility, benefits, application processes and implementation models.

  These were distributed as banners, posters and leaflets across field offices, substations and village-level institutions, so that farmers and local stakeholders could follow them. Regional



Image 4.3 Stakeholder orientation and progress review meeting with farmers, land-owners and developers

language and illustrative content bridged information gaps and improved outreach in rural areas.

- **Stakeholder meetings**

  Regular orientation programmes and progress review meetings were held, commonly monthly, to engage directly with farmers, landowners, developers and local representatives. These interactions clarified queries, addressed concerns on land, connectivity and finance, and shared updates on policy provisions. Continuous engagement built trust, improved participation and aligned stakeholder expectations throughout the project lifecycle.

- **Newspaper publications (in digital and print media)**

  DISCOMs used both print and digital channels to disseminate information on decentralised solar initiatives. Advertisements, informational articles and public notices were published in state-level newspapers, to promote scheme benefits, invite participation and announce tenders. The approach secured broader visibility and attracted potential bidders and beneficiaries across diverse geographies.

- **Live webinars and social media platforms**

  Active participation in panel discussions, seminars, the state expo and industry forums let the DISCOMs engage with developers, financial institutions and wider stakeholder groups. Online webinars provided detailed insight into the scheme structure, bidding processes and implementation guidelines. Social media platforms including Facebook, Instagram, LinkedIn and WhatsApp Status carried updates, success stories and awareness content, reaching a larger and more diverse audience.

- **Push notification strategy**

  The DISCOMs send push notifications directly to all consumers through bulk messaging.

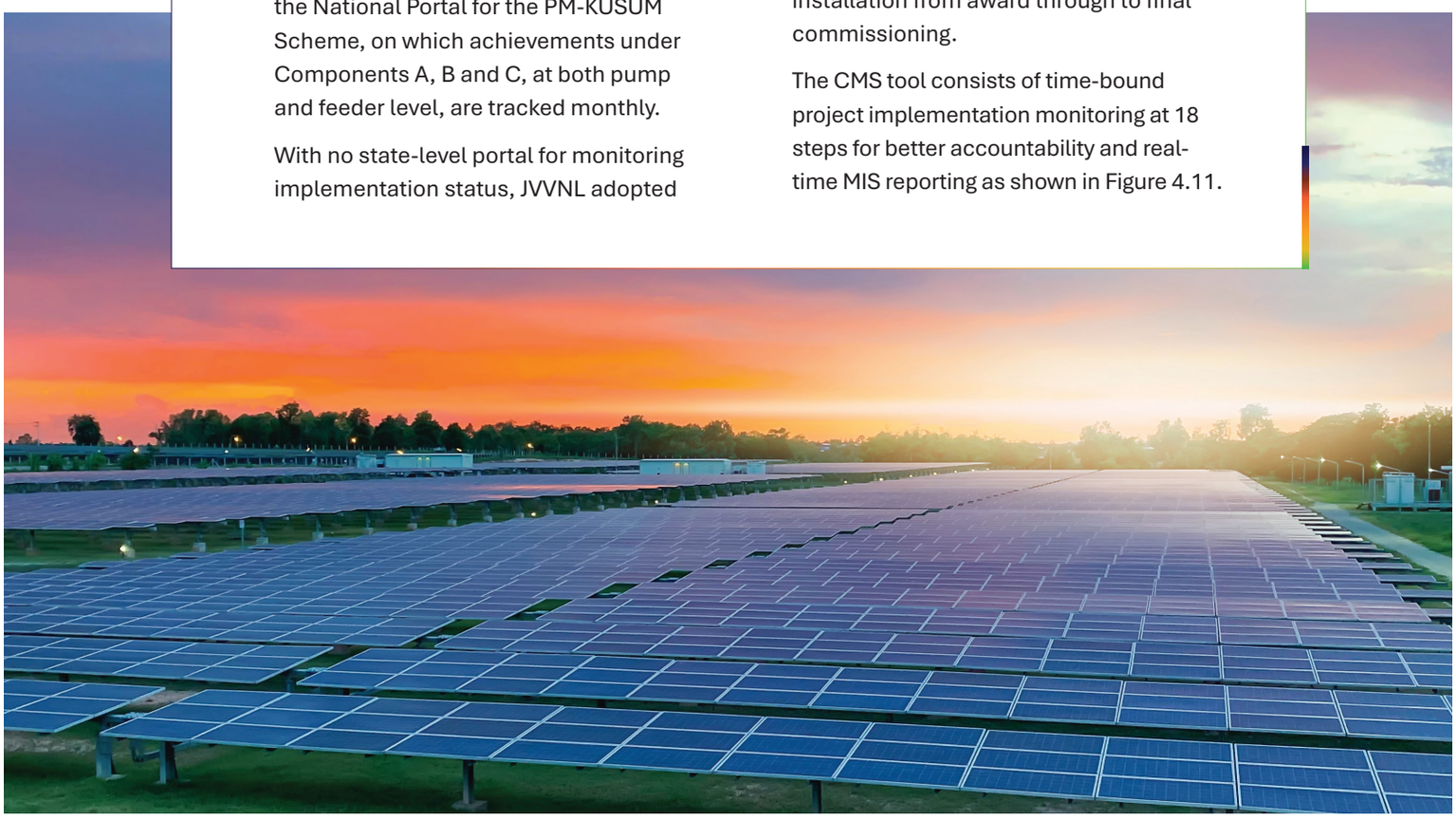
10. Digital interventions

- **Contract Monitoring System (CMS)**

  At the central level, MNRE operates the National Portal for the PM-KUSUM Scheme, on which achievements under Components A, B and C, at both pump and feeder level, are tracked monthly.

  With no state-level portal for monitoring implementation status, JVVNL adopted the Contract Monitoring System on behalf of the three DISCOMs, to track project installation from award through to final commissioning.

  The CMS tool consists of time-bound project implementation monitoring at 18 steps for better accountability and real-time MIS reporting as shown in Figure 4.11.



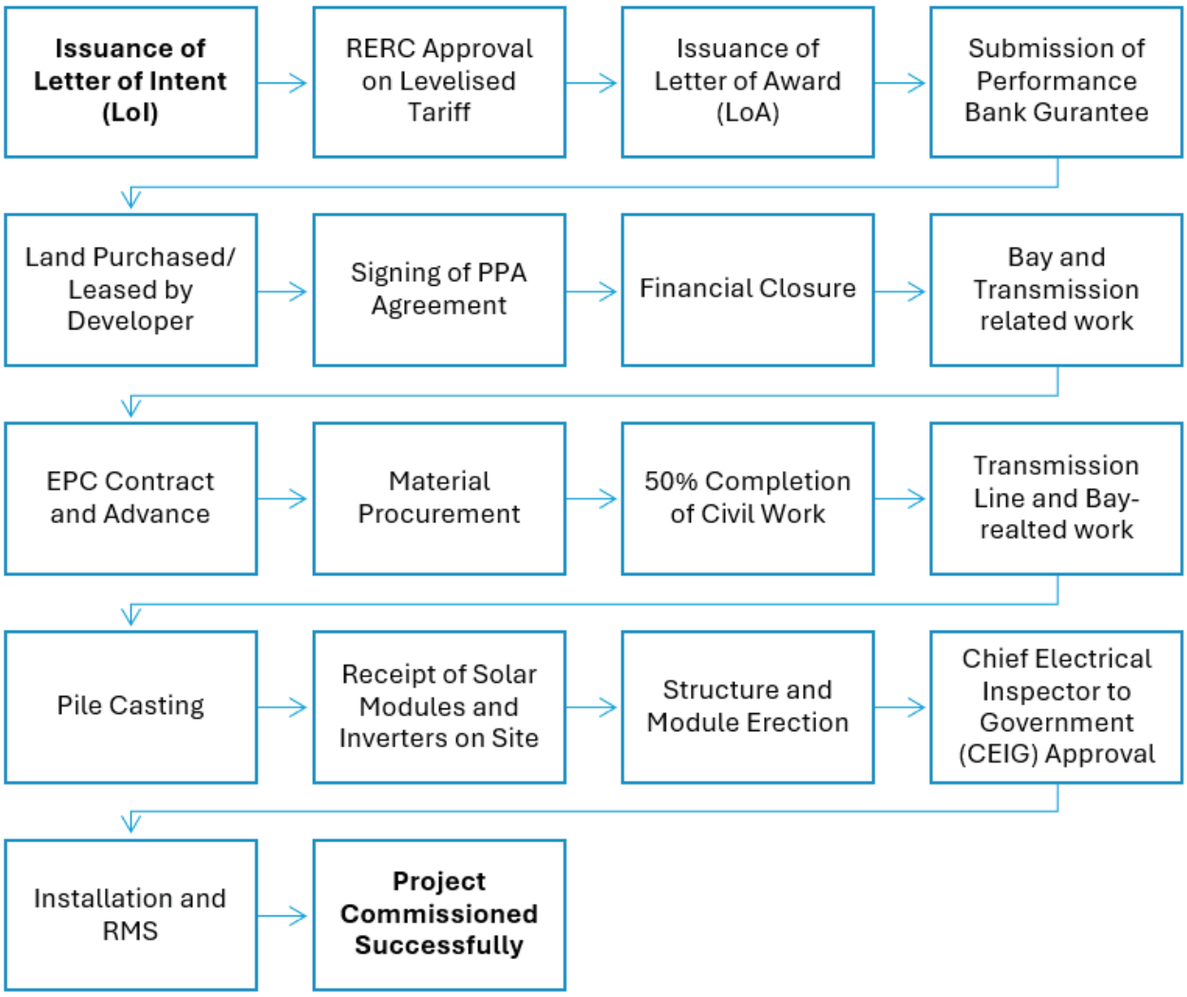


Figure 4.11 Contract Monitoring System, 18-step project implementation cycle

Step-wise monitoring of this kind surfaces delays early, tracks progress efficiently and holds delivery to schedule.

- **AI-powered grid digitisation**

  Jaipur Vidyut Vitran Nigam Limited (JVVNL) is running an AI-powered grid digitisation initiative, transforming its power distribution network to integrate its large renewable energy plants. The initiative has digitised 70% to 80% of the 33 kV and 11 kV networks to date, using AI and machine learning platforms to optimise operations, improve solar hosting capacity, integrate battery energy storage systems and support intelligent demand side management. The roadmap places JVVNL at the front of the energy transition within the distribution sector.

  JVVNL faced operational constraints including limited visibility of the distribution network, inefficient planning for new connections, and integration as well as quality supply challenges owing to distributed solar installations under schemes such as PM Surya Ghar Yojana and PM-KUSUM. High aggregate technical and commercial (AT&C) losses, asset downtime and the growing role of prosumers required a shift from traditional electricity distribution to dynamic grid management, demanding digitalisation and real-time decision support.

  The initiative created a comprehensive 'Digital Twin' of JVVNL's distribution assets using images, geographical data and electrical parameters, enabling real-time GIS visualisation and load flow analysis. AI and ML engines facilitate load forecasting, anomaly detection and optimal power flow, powered through a centralised integrated control centre. Specialised applications address network modelling, technical feasibility assessments for new connections, feeder segregation and advanced solar hosting capacity evaluations. Together these tools strengthen renewable energy integration and improve network response and demand management.

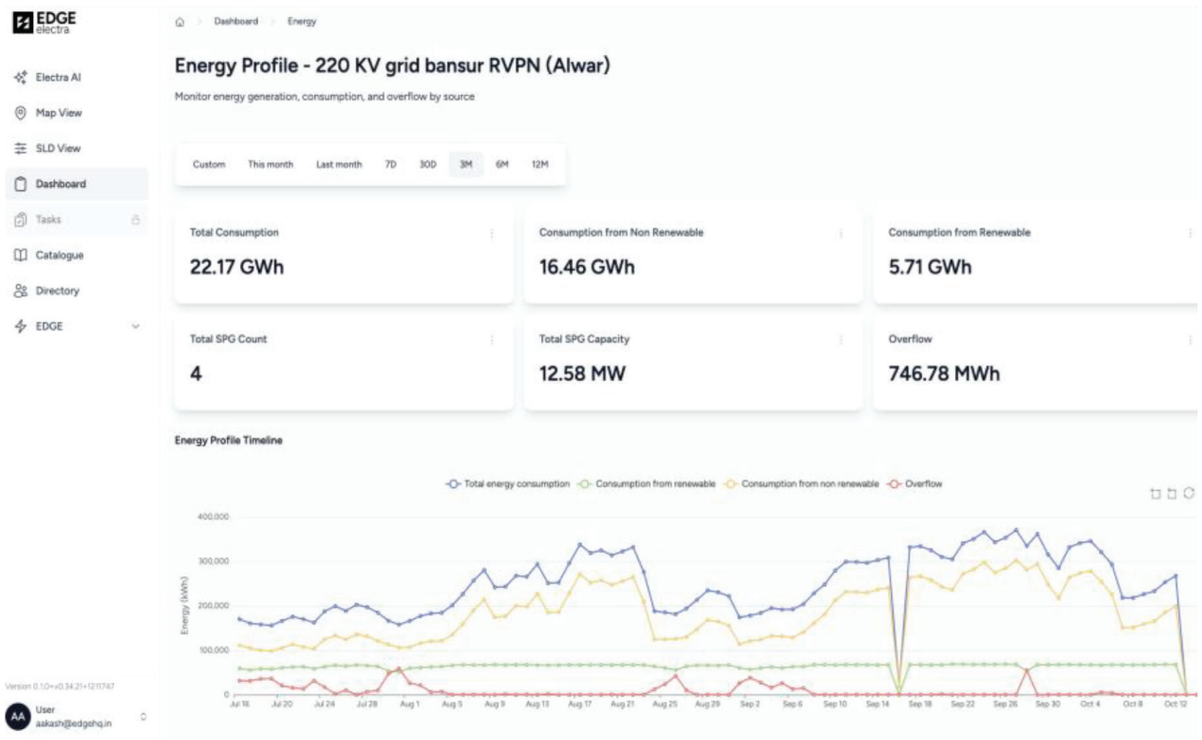


Figure 4.12 JVVNL energy profile dashboard, 220 kV grid substation, Alwar

So far as implemented, the digitisation and AI platform has improved network reliability, reduced asset failures and strengthened the planning and operational efficiency of JVVNL. The integration of solar energy at large scale contributes to increased renewable energy procurement aligned with national and state targets, supporting sustainability goals.

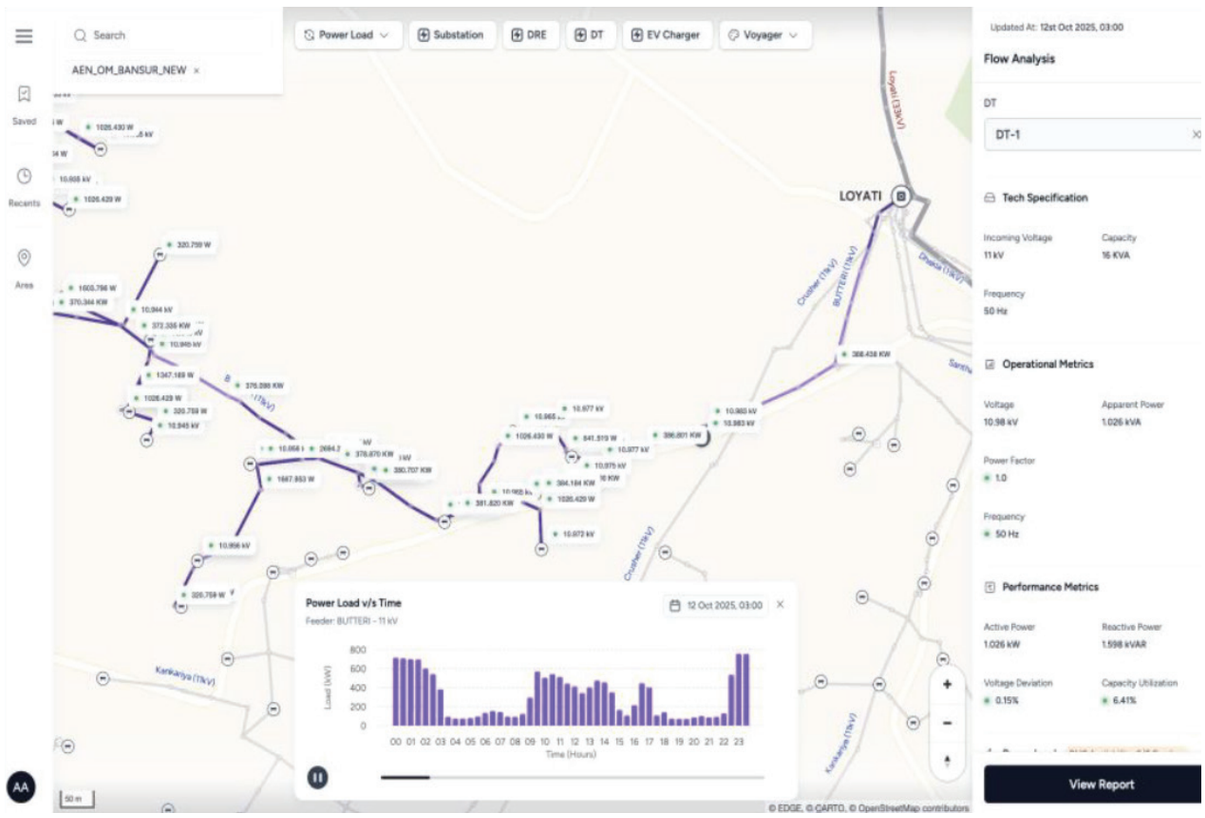


Figure 4.13 JVVNL network visualisation and load flow dashboard

Demand-side management via accurate forecasting allows better load optimisation, reducing peak demand and improving financial outcomes. The initiative is projected to deliver annual financial benefits through improved revenue realisation and operational savings. Stakeholders including consumers, regulatory bodies and the environment gain from cleaner energy use, efficient grid management and better quality of power supply.

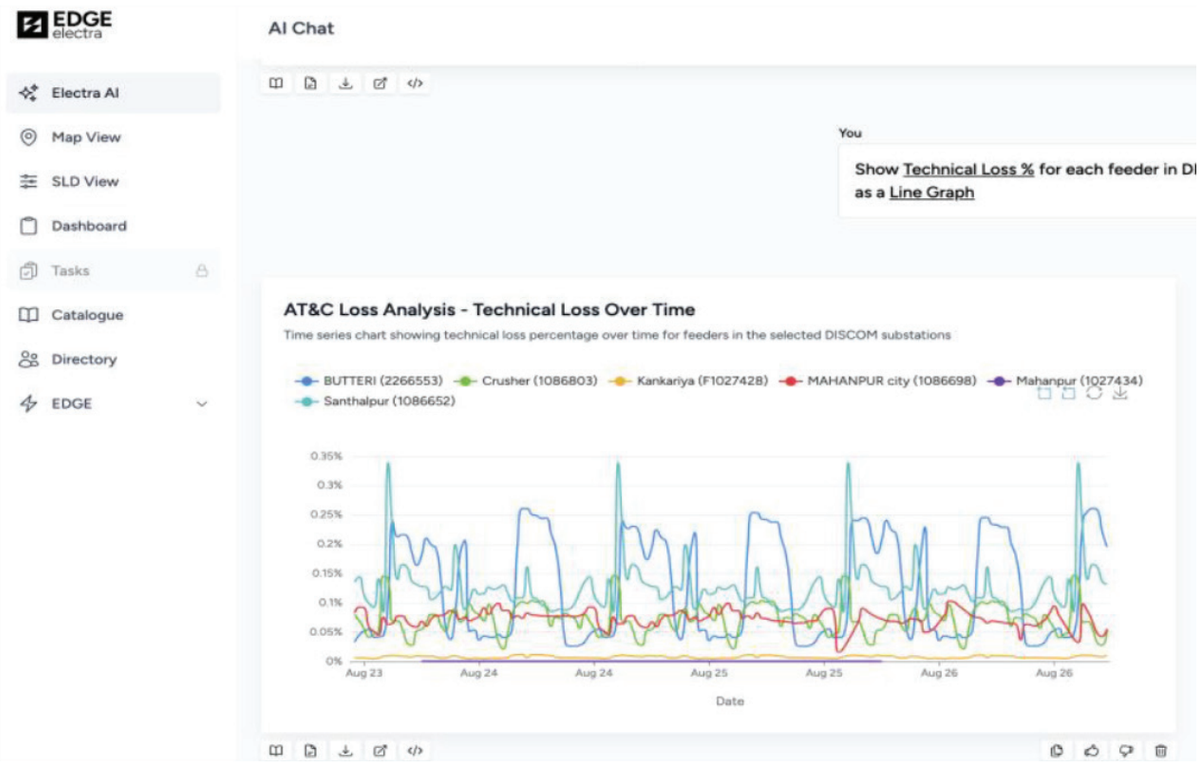


Figure 4.14 AT&C loss analysis across feeders over time

Key benefits for the DISCOMs

- A centralised integrated control centre
- Load forecasting
- Anomaly detection
- Optimal power flow
- Stronger renewable energy integration
- Improved network response and demand side management

Policy and regulatory interventions

To ensure smooth implementation of the PM-KUSUM scheme, projects were executed strictly in alignment with MNRE's office memorandums (OMs) and evolving guidelines from time to time.

Accordingly, tenders over different phases were floated. Whenever any ambiguity or operational challenge arose, the DISCOMs sought clarification from MNRE to maintain compliance and avoid procedural delays.

Regulatory approvals were secured without delay. RERC granted consent for pre-fixed and competitively discovered levelised tariffs, giving financial certainty to developers. The DISCOMs also filed change-in-law petitions promptly to address policy shifts or cost impacts, safeguarding project viability and maintaining regulatory transparency throughout implementation.

These measures strengthened investor confidence and streamlined project execution.

11. Other measures undertaken

- **Help desk**
  Grievance redressal had been scattered across offices, so each DISCOM set up a dedicated help desk. It handles timely resolution and verification of documents submitted by solar power developers, across three areas: approval of the special purpose vehicle, execution of the power purchase agreement, and day-to-day communication with stakeholders on any issue put to DISCOM representatives.

- **Standard operating procedure**
  To ensure timely processing of applications, DISCOMs issued an SOP, reducing or specifying timelines for each activity and sub-activity.

- **Sub-divisional officers are empowered to approve transmission lines within seven working days for the 11 kV network and within 10 working days for the 33 kV network**
- **A timeline of 30 days, being 15 days to issue the demand notice and 15 days to shift the line, in line with RERC guidelines, applies to shifting LT, 11 kV and 33 kV lines passing over land on which an SPV plant is being installed**
- **A timeline of three to five working days applies to pre-dispatch inspection of the CT and PT set, ABT meters and DCR verification, and to appointment of the committee for the site visit covering connectivity, synchronisation and commissioning**

The DISCOMs also issued an order setting out the procedure for processing applications and assigning responsibility to competent committee members. Clarifications were issued from time to time on the following.

- **Ease of signing bipartite and tripartite agreements**
- **Direct payment of land lease into the farmer's account**
- **Submission of the PBG through the special purpose vehicle (SPV)**
- **Applicability of supervision and grid connectivity charges**

12. Risk management

- **Grid availability risk**
  Agriculture feeder solarisation substantially mitigated grid availability risk by shifting dependence from centralised, upstream power supply to localised, daytime solar generation. Decentralisation reduced stress on the transmission network, particularly during peak demand, and delivered a more reliable and predictable supply for agricultural consumers.

- **Force majeure**

  The contractual framework under PM-KUSUM carries well-defined force majeure clauses, which share risk equitably between the parties. They cover a broad range of unforeseen events, including natural disasters, curtailment arising from grid constraints, and changes in law or policy that bear on project viability.

- **Change in law**

  One impact felt by the Rajasthan DISCOMs is variation in the applicable goods and services tax (GST) and basic customs duty (BCD) set by the Central Government from time to time.

  The 56th GST Council meeting, held on 3 September 2025, approved GST reforms effective from 22 September 2025, under which GST on renewable energy devices and parts falling under

HSN codes 84, 85 and 94 was reduced from 12% to 5%.

To address this, the DISCOMs filed a petition "UNDER SECTION 62 (a), SECTION 86 AND SECTION 94 (1) (f) OF THE ELECTRICITY ACT, 2003 READ WITH REGULATION 19 AND 21 OF RERC (TRANSACTION OF BUSINESS), REGULATION, 2021 SEEKING REVIEW OF APPROVED LEVELISED TARIFF FOR SOLAR PV POWER PLANT UNDER PM-KUSUM SCHEME - COMPONENT A and COMPONENT C (FEEDER LEVEL SOLARISATION) AND DETERMINATION OF COMPENSATION / ADJUSTMENT IN LEVELISED TARIFF ON ACCOUNT OF CHANGE IN LAW EVENTS AS PER ARTICLE 12 (CHANGE IN LAW) READ WITH ARTICLE 12.2 (RELIEF FOR CHANGE IN LAW) OF THE POWER PURCHASE AGREEMENT".



Raj crosses 2k MW milestone in solar scheme for farmers

Added Record 1k MW In Rural Areas Within Just Four Months

TOI

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@timesofindia.com

Jaipur: Rajasthan has achieved a renewable energy milestone after crossing the 2,000MW mark under the PM-Kusum scheme, a farmer-focused solar power initiative.

The state, already a frontrunner in solar power generation, added a record 1,000MW of solar capacity in rural areas in just four months - a development that underscores its rapid progress in the sector.

A 1.82MW solar plant commissioned Thursday in Kolada of Sawai Madhopur district pushed the state's total installed capacity under component-A and component-C of the scheme to 2,001MW. Rajasthan now ranks first in the country under component-A and third under component-C, behind Maharashtra and Gujarat.

BIG ACHIEVEMENT

Under component-A, semi-barren and barren farm land is used for solar projects, while agricultural pumps are solarised under component-C.

The state had crossed the 1,000MW mark in May this year, and doubling that capacity within a short span highlights the growing confidence of farmers and private producers in the scheme's implementation.

Willing farmers without capital can tie up with private developers to set up projects under the scheme.

The Chief Minister Bhajan Lal Sharma-led govt has positioned the Kusum programme as a flagship initiative to supply daytime power to all farmers by 2027. Under component-A, farmers in the state can set up grid-connected solar plants of up to 2MW, while component-C supports systems up to 5MW. The Union govt provides financial assistance of Rs 1.05 crore per MW, equivalent to 30% of the project cost, under component-C.

So far in the state, 357 projects with a combined capacity of 462.7MW have been installed under component-A, with another 955 projects totalling 1,538.4MW under component-C. Of this, Jodhpur discom leads with 1,628MW, followed by Jaipur (214MW) and Ajmer (158MW).

In the past 20 months of the current BJP govt's tenure, Rajasthan added 1,878MW of new capacity, a fifteenfold jump from what existed previously. In recognition of this performance, the Union Ministry of New and Renewable Energy has raised the state's target to 5,250MW under component-A and 4 lakh solar pumps under component-C.

So far, 1.28 lakh agricultural pumps have been solarised across the state.

During his visit to Banswara on Sept 25, Prime Minister Narendra Modi lauded Rajasthan's performance under the Kusum scheme and interacted with farmers who have leveraged it to become solar entrepreneurs.

He also praised their role in supporting the country's clean energy transition.

Image 4.4 Press coverage of Rajasthan crossing 2,000 MW under the agricultural solar scheme

As of June 2026, RERC, by suo motu order dated 3 June 2026, accepted the variation in GST as a change in law event and directed recovery of the GST benefits from the eligible solar power developers.

4.8 Implementation progress

Rajasthan has emerged as the leading state in the implementation of decentralised solar power projects under the PM-KUSUM scheme, ranking first nationally in capacity-wise deployment of decentralised solar plants, which reflects strong policy execution and institutional coordination.

As of 24 June 2026, under Component A, against a total sanctioned, awarded and PPA-signed capacity of 5,618 MW, the state has commissioned 1,137 MW, which is steady physical progress following near-complete contractual closure. Under Component C for feeder level solarisation, out of a sanctioned capacity for solarising 400,000 agricultural pumps, equivalent to 5,367 MW, projects for 5,015 MW have been awarded and tied up through PPAs, with 3,422 MW serving around 220,000 agricultural consumers already commissioned. Execution has run faster here, driven by feeder-based aggregation of agricultural load. Cumulatively, Rajasthan has brought into operation 4,558 MW of the 10,633 MW sanctioned across Components A and C, supported by 100% PPA signing at around 10.6 GW and a consistent capacity addition trajectory. The commissioning trend is shown in Figure 4.15.

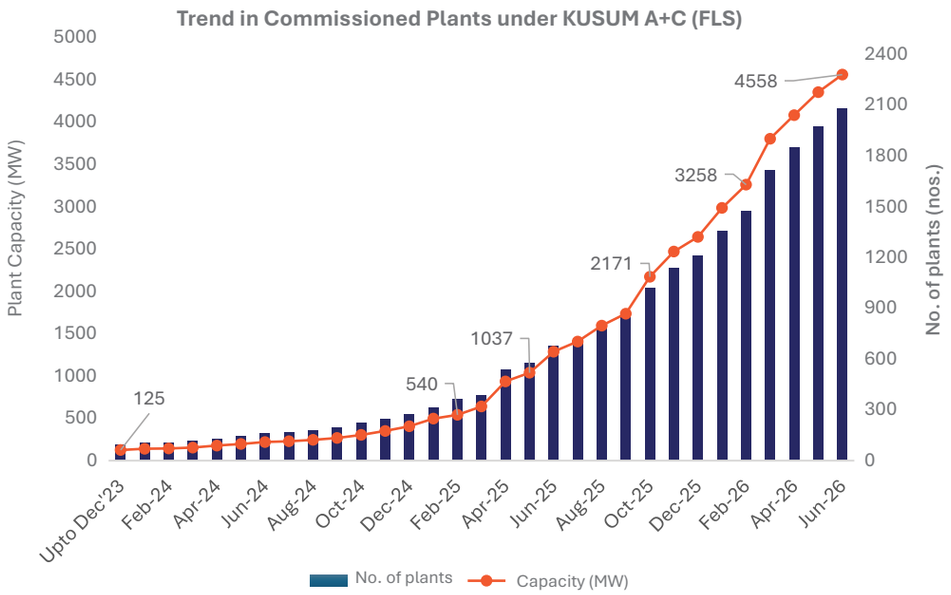


Image 4.15 Commissioning trend under PM-KUSUM Components A and C (FLS)

Implementation has shifted markedly from initial tendering and aggregation to accelerated commissioning, particularly under Component C, where feeder-level solarisation has allowed faster deployment close to load centres, reducing transmission dependency and improving operational efficiency. Component A has commissioned more gradually, since its sanction from MNRE was allocated only recently.

RAJASTHAN

State emerging as major hub of decentralised solar energy

ANIL SHARMA
Jaipur, 10 July

Along with making strides in solar energy, Rajasthan is also emerging as the country's major hub in the field of decentralised solar energy, Arti Dogra, chairman, Jaipur DISCOMs, said.

"In the past year, the state has achieved progress in this field. This has been possible due to the effective implementation of the Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (Kusum Yojana) at the ground level," she said.

As a result, 684 decentralised solar power plants, with a total capacity of 1305 Mw, have been established in the state. A senior official of the energy department said that of these, 592 plants, with a capacity of 1190 Mw, have been developed within a year.

Dogra highlighted that these plants are not being set up by industrialists or big commercial groups. These plants are being set up by farmers, whom she calls "solarpreneurs". These farmers, often in partnership with developers, are utilising barren land near the fields to generate solar power, thus tapping into rural entrepreneurship.

Dogra said instead of big solar plants, the Kusum scheme focuses on smaller grid-connected plants set up within a 5-kilometre radius of a grid substation. This localised approach helps in minimising transmission losses.

Under the Kusum scheme, she said, component-A allows for grid- connected solar plants of up to 2 Mw, while component C allows for installations of up to 5 Mw. In component- C, the central government provides financial assistance of ₹1.05 crore per Mw, covering 30 per cent of the cost.

Chief Minister Bhajanlal Sharma has committed to provide daytime electricity to farmers in the state by 2027.

Image 4.5 Press feature on Rajasthan as a hub for decentralised solar energy

Rajasthan's achievement lies in execution maturity as much as in scale, moving from early-stage bottlenecks to rapid capacity addition. That confirms its leadership in decentralised renewable energy deployment and its contribution towards both state and national renewable energy targets.

4.9 Stakeholder-wise benefits

Building upon Rajasthan's leading position in decentralised solar deployment, the implementation of Components A and C has generated benefits across several stakeholder groups, confirming the scheme's standing as a flagship initiative. It has accelerated renewable capacity addition and, at the same time, built a sustainable and inclusive growth model that reaches farmers, private developers, the DISCOMs and the state government.

By promoting localised solar generation near agricultural load centres and securing assured offtake through structured frameworks, the initiative has widened energy access, improved financial viability across the value chain and strengthened grid efficiency. The socio-economic gains run from improved farm productivity and additional income streams for landowners to reduced operational losses for the DISCOMs and faster progress towards renewable energy targets for the state government. Together they position PM-KUSUM in Rajasthan as a benchmark for decentralised clean energy implementation in the country. The stakeholder-wise benefits follow.

1. Farmers and landowners

- Assured and reliable daytime power supply for irrigation, reducing dependence on erratic grid supply
- Reduction in diesel consumption and irrigation costs, leading to higher farm profitability
- Additional, stable income of around ₹80,000 to ₹160,000 per hectare a year, escalating 5% every two years, from leasing land for solar projects
- Improved crop productivity due to timely irrigation and better farming practices
- Access to voltage-stabilised three-phase power, enhancing equipment efficiency and longevity
- Better socio-economic wellbeing, including living standards, safety and leisure time



Image 4.6 Direct Samvad of the Prime Minister with PM-KUSUM beneficiaries, Banswara, Rajasthan

2. Solar power developers

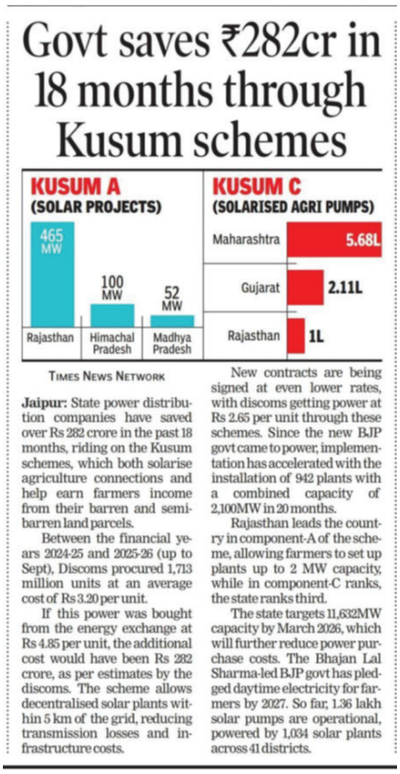
- Stable long-term revenue through PPAs with RUVITL and the DISCOMs
- Reduced market risk through assured offtake of generated power
- Decentralised project opportunities with relatively faster implementation timelines
- Payment security through mechanisms such as letters of credit and escrow arrangements
- An investment opportunity of more than ₹31,000 crore in Rajasthan, on around 10.6 GW at ₹3 crore per MW
- Contribution to renewable energy targets while ensuring commercially viable investments

3. Rajasthan DISCOMs

- Reduction in AT&C losses through localised solar generation
- Lower subsidy burden due to reduced cost of power procurement
- Improved grid stability and reduced transmission losses via decentralised generation
- Greater reliability of power supply to rural and agricultural feeders
- Better financial discipline through structured payment security mechanisms
- Contribution to renewable energy targets while ensuring commercially viable investments
- Improved financial health, with savings of ₹282 crore in 18 months



Image 4.8 Beneficiary interaction on agricultural feeder solarisation, Rajasthan



Govt saves ₹282cr in 18 months through Kusum schemes

TIMES NEWS NETWORK

Jaipur: State power distribution companies have saved over Rs 282 crore in the past 18 months, riding on the Kusum schemes, which both solarise agriculture connections and help earn farmers income from their barren and semi-barren land parcels.

Between the financial years 2024-25 and 2025-26 (up to Sept), Discoms procured 1,713 million units at an average cost of Rs 3.20 per unit.

If this power was bought from the energy exchange at Rs 4.85 per unit, the additional cost would have been Rs 282 crore, as per estimates by the discoms. The scheme allows decentralised solar plants within 5 km of the grid, reducing transmission losses and infrastructure costs.

New contracts are being signed at even lower rates, with discoms getting power at Rs 2.65 per unit through these schemes. Since the new BJP govt came to power, implementation has accelerated with the installation of 942 plants with a combined capacity of 2,100MW in 20 months.

Rajasthan leads the country in component-A of the scheme, allowing farmers to set up plants up to 2 MW capacity, while in component-C ranks, the state ranks third.

The state targets 11,632MW capacity by March 2026, which will further reduce power purchase costs. The Bhajan Lal Sharma-led BJP govt has pledged daytime electricity for farmers by 2027. So far, 1.36 lakh solar pumps are operational, powered by 1,034 solar plants across 41 districts.

4. State government

- Progress towards renewable energy and climate targets, supporting the national commitment of 500 GW by 2030
- A contribution towards achieving 125 GW of renewable wer projects, including 90 GW from solar, by 2030 under the Rajasthan Integrated Clean Energy Policy 2024
- Lower subsidy outflows for agricultural power through cost-efficient solar procurement
- Promotion of rural development, employment and local economic activity
- Strengthening of energy security and diversification of power sources
- Environmental gains through lower carbon emissions and reduced fossil fuel dependence

4.10 Socio-economic impact

The agriculture feeder solarisation initiative has delivered significant socio-economic benefits by improving both access to power and rural livelihoods.

With the addition of nearly five hours of uninterrupted electricity, added generation capacity has cut power cuts and delivered reliable daytime supply, including consistent three-phase and voltage-stabilised power for agricultural use. Farming practices have shifted for about 78% of users, with 74% relying on irrigation pumps, 17% of which are now solar-powered, which raises productivity and sustainability.

At the household level, **90% of users reported improved quality** of life from dependable electricity, including longer study hours for children and greater use of appliances such as mobile phones and televisions (noted by 34% of users).

Farmers have also benefited financially, with additional income from land lease arrangements. Beyond economic gains, users reported better work-life balance, more leisure time and improved safety conditions for both men and women. Most non-users, at 92%, observed no change, which measures the difference the scheme makes to those connected to it.

Wider gains for the rural economy

- Safety, particularly for women, with cultivation shifting from night-time to daytime
- Development of ancillary industries
- Greater local employment through plant operations
- Improvement in agricultural productivity and farmer incomes
- Benefits in agricultural carbon credit through sustainable farming practices, where applicable
- Adoption and replication in surrounding villages

Jalore district is among the clearest examples of active participation by women at the grassroots level.

4.11 Lessons learnt

Key lessons from the implementation of agriculture feeder solarisation in Rajasthan point to the value of practical, developer-friendly approaches to tendering and project execution.

Flexibility in project structuring, robust payment security mechanisms and realistic assessment of on-ground challenges such as land availability are critical to ensuring bidder participation and timely project rollout.

Aligning policy intent with market realities, while maintaining financial discipline through instruments such as letters of credit and escrow arrangements, builds investor confidence and delivers on programme objectives under the PM-KUSUM scheme. The main lessons from scheme and project implementation follow.

i. A land bank portal matters early in scheme implementation

One of the most critical bottlenecks during implementation was the identification and aggregation of suitable land parcels for solar PV installations near 33/11 kV substations. The portal allowed the DISCOMs to deliver the following.

- **Land readily available for ground-mount solar PV before tendering began**
- **Shorter project conversion timelines, from bidding through to commissioning**
- **Developer access to several land options nearest the 33/11 kV substations**
- **Greater bidder confidence and participation, since land uncertainty had been among the largest perceived risks in the early implementation period**

ii. IEC programmes need to run continuously

The IEC activities have proven to be fundamental for stakeholder awareness, acceptance and participation, particularly at the grassroots level. Through them the DISCOMs secured the following.

- **Wide participation from farmers, landowners, local communities and private developers, who often have limited awareness of scheme benefits**
- **Trust built through regular workshops, seminars, field visits, demonstrations and local outreach, which headed off resistance on the ground**
- **Clarity on land leasing models, compensation structures and long-term benefits, which eased land acquisition and community engagement**
- **Less misinformation and stronger community support for decentralised renewable projects at scale**

iii. Regular interaction across stakeholders

Coordination runs across MNRE, District Collectors, banks and financial institutions, vendors, manufacturers, developers and DISCOM officials.

The complexity of feeder solarisation calls for continuous coordination among stakeholders, each with distinct roles and responsibilities. The DISCOMs closed the gaps as follows.

- Regular review meetings bringing together MNRE, the DISCOMs, district administration, financial institutions, developers, EPC contractors and equipment manufacturers, which closed communication gaps and moved the framework forward
- Quick response to implementation bottlenecks, including financing, grid connectivity, approvals and supply chain disruption
- Involvement of District Collectors, particularly effective in resolving local land, law-and-order and administrative issues, and in securing connectivity to the nearest substations
- A structured coordination mechanism, which improved accountability and transparency across the project lifecycle

iv. Developers should secure right of way before installation

Right of way (RoW) challenges have been a recurring cause of delays in project execution. The DISCOMs mitigated the risk as follows.

- All RoW permissions for sub-transmission lines and for access across roads, railways and water bodies are secured before construction begins
- Quick response to implementation bottlenecks, including financing, grid connectivity, approvals and supply chain disruption
- Early resolution of RoW issues avoids cost overruns, disputes with local landowners and project delay

v. Timely execution matters in a shifting market

The renewable energy sector sees rapid shifts in technology costs, supply chains and financing conditions, which bear directly on project viability. The DISCOMs limited cost and delivery risk as follows.

- Cost escalation from rising module and equipment prices was contained
- Developers that executed within the stipulated timelines held their financial viability and avoided renegotiation
- The DISCOMs began realising savings from reduced power purchase costs
- Strict adherence to timelines, backed by penalty mechanisms, maintained discipline in project execution

vi. Broader cross-cutting learnings

Beyond the specific lessons above, Rajasthan's experience points to four broader principles.

- **Flexible and developer-friendly tender structures** enhance participation by accommodating varying project sizes, site conditions and business models
- **Robust payment security mechanisms** such as letters of credit and escrow arrangements mitigate DISCOM payment risk and attract private investment
- **Realistic ground-level planning,** particularly for project monitoring, land readiness, standard operating procedures, internal approvals, grid availability and local constraints, prevents implementation delay
- Aligning policy ambition with market realities ensures that schemes remain both attractive to investors and sustainable for utilities

Implementation of agriculture feeder solarisation under PM-KUSUM in Rajasthan has yielded practical insight that reaches past policy design into the realities of execution. The scheme has shown strong potential in reducing subsidy burden, improving power reliability for farmers and promoting renewable energy adoption, and its success has turned on how effectively on-ground challenges are managed.

4.12 Supporting images

Appreciation received



Image 4.9 and 4.10 Social media recognition of Rajasthan's PM-KUSUM performance



Image 4.11 and 4.12 Social media posts on smart metering and the JVVNL smart meter rollout



Image 4.13 and 4.14 Social media posts on national recognition for the Rajasthan DISCOMs, and on farmer benefit under PM-KUSUM



Image 4.15 and 4.16 Social media posts on Rajasthan's renewable energy standing, and the annual AIDA award



Image 4.17 and 4.18 Press and social media coverage of the Shyampura-Ishwarpura solar plant commissioning, and of new PM-KUSUM capacity in Rajasthan



Recommended implementation framework

This chapter presents a sequenced, risk-controlled implementation framework for agricultural solarisation. It consolidates Rajasthan's experience in feeder sizing, RESCO-led implementation, land facilitation, regulatory approval, payment security and digital monitoring, together with Maharashtra's MSKVY 2.0 experience in mission-mode roll-out, land and connectivity readiness, cluster packaging, single-window facilitation and payment security. The framework is designed for DISCOMs and state agencies.



5.1. Phase 1, planning

The planning phase establishes the strategic and analytical foundation of the programme. It should culminate in a clear state-level implementation roadmap, supported by validated demand data, feeder prioritisation, capacity sizing methodology and institutional accountability.

5.1.1 Approach

- Define the objective. Reliable daytime agricultural supply, subsidy reduction, decentralised renewable energy and DISCOM financial improvement
- Map the base. Agricultural consumers, connected load, feeder-wise consumption, agriculture-dominated substations, segregated feeders and the existing supply pattern
- Prioritise substations and feeders by agricultural load, feeder segregation, land availability, bay availability, grid absorption capacity and local readiness
- Determine project capacity from the applicable PM-KUSUM or state guidelines, feeder consumption, peak demand, CUF assumptions and CFA eligibility
- Decide the implementation model, whether RESCO, CAPEX, PPP, individual project, cluster or a hybrid suited to local conditions
- Create a governance roadmap defining the responsibilities of the Energy Department, the DISCOMs, the state nodal agency, the regulator interface, district administration, developers, lenders and farmers

5.1.2 Risk mitigation

Table 5.1 Phase 1 planning, risk areas and mitigation

Risk area	Possible challenge	Mitigation strategy	Accountability
Inaccurate demand assessment	Capacity may be under-sized or over-sized, causing poor utilisation or excess injection.	Use feeder-wise historical consumption, peak demand review, connected load validation and periodic data reconciliation.	DISCOM planning and energy audit teams
Weak feeder prioritisation	Projects may be awarded where grid or land readiness is poor.	Adopt a prioritisation matrix covering load, land, bay, grid absorption and local readiness before tendering.	DISCOM
Unclear implementation model	Risk allocation may remain ambiguous and bidder confidence may fall.	Approve the model at steering committee level before bid preparation and align it with fiscal capacity and market feedback.	State steering committee and state government
Regulatory uncertainty	Tariff approval or procurement adoption may be delayed after bidding.	Set the regulatory strategy early, covering the tariff route and PPA principles.	DISCOM regulatory cell

5.2. Phase 2, development

The development phase converts the planning roadmap into bankable, site-ready and grid-compliant project packages. Implementation risk is reduced here, before procurement is launched.

5.2.1. Approach

- Prepare a substation-wise project inventory covering feeders, consumers, consumption, proposed capacity, land requirement, grid voltage and CFA eligibility
- Identify land through government land mapping, private land lease, farmer-owned land, land portal, revenue land SPV or district facilitation
- Conduct a joint site survey verifying land title, GPS coordinates, contiguity, route distance, access, RoW constraints, bay availability and tentative single-line diagram
- Assess grid readiness, covering transformer loading, bay availability, protection requirement, evacuation voltage, solar hosting capacity and synchronisation requirement
- Mobilise stakeholders in a structured way, across farmers, land-owners, Gram Panchayats, developers, banks and district administration
- Prepare standard bid documents, PPAs, lease formats, connectivity formats, metering protocols, commissioning checklist and SOPs

5.2.2. Risk mitigation

Table 5.2 Phase 2 development, risk areas and mitigation

Risk area	Possible challenge	Mitigation strategy	Accountability
Land unavailability or title risk	Awarded projects may not proceed despite tariff discovery.	Create a land bank or land portal, verify title and litigation status, and hold alternate land options before tendering.	Land facilitation cell and district administration
Right of way uncertainty	The evacuation line may face local objection and delay commissioning.	Map the tentative route at development stage and flag crossings, access roads and local constraints before award.	DISCOM field office and district team
Grid readiness gap	Bay or transformer constraints may surface after the PPA is signed.	Conduct pre-bid grid feasibility and put bay augmentation responsibility and timelines in the bid documents.	DISCOM technical wing
Low stakeholder acceptance	Farmers and Gram Panchayats may resist land use or construction.	Run continuous IEC, publish lease and benefit structures, and institutionalise stakeholder consultation.	DISCOM and district administration

5.3 Phase 3, procurement and contracting

The procurement and contracting phase establishes competition, tariff discovery, regulatory certainty and contractual bankability. The procurement design must reflect local land realities, grid readiness and developer appetite.

5.3.1 Approach

- Select the tender packaging, whether individual project, substation package, district package, cluster model, aggregated state-level package or hybrid structure
- Define bid parameters including contracted capacity, delivery point, CUF, connectivity voltage, land responsibility, evacuation scope and commissioning timeline
- Specify performance security, generation shortfall treatment, excess generation treatment, curtailment, force majeure and change-in-law provisions
- Set eligibility criteria that hold technical and financial discipline
- Secure regulatory approval or tariff adoption, including procurement route, PPA approval and treatment of deviations, if any
- Build payment security into the tender and PPA through Letter of Credit (LC), escrow, revolving fund or equivalent mechanism
- Follow a controlled contracting sequence: tender, pre-bid, bid evaluation, tariff discovery, regulatory approval, LoI, PBG, LoA, PPA, land agreement, connectivity agreement and financial closure

5.3.2 Risk mitigation

Table 5.3 Phase 3 procurement and contracting, risk areas and mitigation

Risk area	Possible challenge	Mitigation strategy	Accountability
Poor tender packaging	Small or fragmented projects may not attract strong bidder participation.	Sound the market and select individual or cluster packaging according to land aggregation and developer appetite.	DISCOM procurement cell
Bankability concern	Developers may price risk higher, or lenders may hesitate.	Include a standard PPA, payment security, clear land and connectivity responsibility, and regulatory certainty before award.	DISCOM procurement and finance cells
Tariff or regulatory delay	Contracting may stall after bidding.	Align the tariff route in advance and file petitions promptly for determination or adoption.	DISCOM regulatory cell
Contract ambiguity	Disputes may arise on excess generation, shortfall, curtailment or change in law.	Standardise risk allocation clauses, with measurable triggers, timelines and compensation principles.	DISCOM legal and commercial teams

5.4 Phase 4, execution

The execution phase converts awarded capacity into commissioned capacity. The focus should shift to field-level coordination, financial closure, construction discipline, grid integration, statutory approvals, commissioning and post-commissioning monitoring.

5.4.1 Approach

- Begin central project monitoring immediately after the LoA, tracking each project through milestone dashboards
- Support financial closure through lender meetings, PPA readiness, payment security confirmation and land documentation
- Resolve land possession, access road, local objections and right-of-way issues through district-level coordination
- Implement the evacuation line, bay work, protection systems, metering systems and communication infrastructure in parallel with plant construction
- Monitor site mobilisation, civil works, pile casting, module and inverter delivery, mounting structure erection, cabling, transformer installation and RMS integration
- Obtain CEIG and statutory approvals, conduct testing, synchronise the plant and declare commercial operation
- Operationalise ABT/gross metering, joint meter reading, RMS data, billing, payment reconciliation, CUF monitoring and contract compliance

5.4.2 Risk mitigation

Table 5.4 Phase 4 execution, risk areas and mitigation

Risk area	Possible challenge	Mitigation strategy	Accountability
Delay in financial closure	Construction may not start despite the LoA and PPA.	Track financial closure as a milestone, and resolve lender concerns on land, payment security and regulatory approval.	DISCOM PMU, developers and lenders
Construction delay	Market dynamics and supply chain shifts can affect project viability.	▸ Link milestones to the performance bank guarantee, liquidated damages and escalation reviews. ▸ Monitor progress through the Contract Monitoring System.	DISCOM PMU and developers
RoW and local disputes	The evacuation line or access road may be blocked.	Empower district coordination groups and settle route permissions before major equipment is mobilised.	District administration and DISCOM
Metering and accounting gaps	Billing disputes may arise after commissioning.	Install ABT-compliant meters, RMS, joint meter protocols and online data sharing before commercial operation.	DISCOM metering and commercial teams

5.5 Grid augmentation and battery energy storage system planning

Grid augmentation and BESS planning should be treated as a dedicated technical workstream within the agricultural solarisation programme. As feeder-level solar capacity scales up, DISCOMs should assess distribution network readiness, including hosting capacity, evacuation infrastructure, transformer and bay adequacy, voltage profile, protection systems, metering, communication and operational flexibility. This assessment should be completed during the project development stage, so that required augmentation works are identified, budgeted and aligned with the implementation schedule before procurement finalisation.

BESS is deployed selectively, against clearly established techno-commercial use cases such as peak management, solar shifting, ramp control, curtailment reduction, voltage support, reliability improvement or deferral of network augmentation. Sizing follows feeder load curves, solar generation profiles, grid constraints, discharge duration, cycling requirements and the economic value of avoided power purchase or deferred infrastructure investment. Clear provisions for ownership, cost recovery, regulatory treatment, safety compliance, metering, dispatch and performance monitoring are settled before award, securing technical reliability, commercial bankability and scalable integration of renewable energy into rural distribution networks.

5.5.1 Approach

- *Undertake* substation-wise and feeder-wise load-flow studies to assess existing agricultural load, proposed solar injection, transformer loading, voltage profile, reverse power flow conditions and fault-level implications
- *Determine* the grid augmentation scope prior to finalisation of project packages, including bay extension, conductor upgradation, transformer augmentation, protection relays, metering systems, communication links, SCADA/RMS integration and evacuation line strengthening
- *Define* interconnection voltage and evacuation responsibility upfront, considering project capacity, distance from the substation, bay availability and the ability of the local distribution network to absorb the proposed solar generation
- Assess expected solar generation against feeder-level agricultural demand, including agricultural load curves, seasonal irrigation patterns, feeder supply schedules and potential curtailment periods
- Define the BESS use case before sizing, whether solar shifting, peak shaving, ramp-rate control, voltage support, curtailment reduction, reliability enhancement or deferral of network augmentation
- Size the BESS in MW and MWh using net-load analysis, solar generation profile, feeder demand profile, discharge duration requirement, cycling assumptions, degradation profile and commercial value of avoided cost or improved reliability
- Evaluate BESS ownership and procurement options, including DISCOM-owned BESS, developer-owned co-located BESS, pooled substation-level BESS or service-based storage procurement
- Incorporate BESS and grid augmentation milestones into the project monitoring dashboard, covering design approval, equipment procurement, installation, testing, communication integration, safety clearance and operational performance tracking
- Establish operating protocols for BESS dispatch and grid integration, including charging windows, State of Charge limits, feeder availability, emergency response, metering, data reporting and settlement mechanisms

5.5.2 Risk mitigation

Table 5.5 Grid augmentation and battery storage planning, risk areas and mitigation

Risk area	Possible challenge	Mitigation strategy	Accountability
Grid hosting capacity	Solar projects may face curtailment, voltage rise, reverse power flow or delayed commissioning through network constraints.	▸ Conduct load-flow and hosting capacity studies before tendering. ▸ Set project capacity against validated evacuation capability.	DISCOM planning and technical wing
Delayed augmentation works	Bay extension, transformer augmentation or line strengthening may lag behind solar plant construction.	Treat grid augmentation as a parallel critical path, with clear milestones, budget approval and an escalation mechanism.	DISCOM planning and technical wing
BESS sizing	An oversized BESS raises cost without matching benefit, and an undersized one fails to meet grid or supply objectives.	Size the BESS against a defined use case, the feeder net-load profile, discharge duration, cycling requirement and quantified operational value.	DISCOM planning and storage specialist
Ownership and cost recovery	Ambiguity over whether the BESS is owned by the DISCOM, the developer or a third party may delay procurement and regulatory approval.	Define ownership, revenue model, tariff treatment, capital and operating cost recovery, and performance obligations before procurement.	State steering committee and regulatory cell
Safety and compliance	Battery installation may carry fire, thermal, electrical or environmental risk where standards are not enforced.	Mandate applicable safety standards, fire protection systems, an emergency response plan, OEM warranties and statutory approvals before charging.	DISCOM safety cell, CEIG and developer



From India's Experience to Global Application

Lessons for Scaling Solar-Powered Irrigation and Agricultural Solarisation

6.1 From an Indian programme to transferable global lessons

India's experience with agricultural solarisation offers lessons that extend beyond the specific institutional and subsidy architecture of PM-KUSUM. The principal value of this experience for other countries is not that the Indian programme can be replicated exactly. Rather, it demonstrates how solar irrigation can evolve from deployment of individual equipment into a structured programme connecting **agriculture, energy access, utility economics, finance, water management, infrastructure and rural development.**



PM-KUSUM itself illustrates this portfolio approach. It provides different pathways for decentralised generation, stand-alone solar agricultural pumps, solarisation of existing grid-connected pumps and feeder-level solarisation. The Guidebook similarly concludes that the appropriate model should be determined by factors such as load concentration, feeder segregation, land and grid availability, financing capacity, institutional capability, risk allocation and groundwater conditions rather than by a uniform technology preference.

India has also accumulated implementation experience at considerable scale. According to the Government of India's PM-KUSUM National Portal, as of **31 August 2026,** approximately **1.18 million stand-alone solar agricultural pumps** had been installed under Component B, while about **1.63 million agricultural pumps had been covered through feeder-level solarisation.** The programme had also commissioned 2,192.82 MW under Component A.

The scale is important because it allows lessons to be drawn not only from technology performance, but also from the institutional, financial and implementation challenges that emerge when a programme moves from pilots to mass deployment. It also helps country “decarbonise” its grid by way of shifting to solar energy and improves the “energy efficiency” by way of reducing wasteful operation. On operational level for grid, it allows flattening demand curve as well by shifting the irrigation load to solar hour.

6.2 Lesson 1: Start with the irrigation and energy problem, not with a solar-pump target

The first transferable lesson is that a solar irrigation programme should begin with an assessment of how farmers obtain water and energy, rather than with a predetermined number or capacity of solar pumps.

The Guidebook distinguishes between substantially different operating contexts. Stand-alone solar pumps are suited to farms without reliable grid access and can replace diesel pumping or provide irrigation where electricity extension is difficult. Individual grid-connected solarisation becomes relevant where farmers already have grid-connected pumps and appropriate metering and settlement arrangements can be established. Feeder-level solarisation becomes more attractive where agricultural demand is concentrated on segregated feeders and a utility can supply multiple farmers from a common decentralised solar plant.

For an international programme, the starting diagnostic should therefore establish at least:

- **the number, type and capacity of existing irrigation pumps;**
- **electricity availability, quality, hours of supply and tariffs;**
- **dependence on diesel or other fuels;**
- **irrigation demand, crop patterns and seasonality;**
- **groundwater or surface-water source, pumping head and water availability;**
- **farm size and farmers' capacity to contribute financially;**
- **distribution-network configuration where grid-connected solutions are contemplated; and**
- **the availability of local installation, maintenance and financing ecosystems.**

The implication is significant: solar pumping is not a single product intervention. Different agricultural-energy conditions require different delivery models.

6.3 Lesson 2: Match the delivery model to local conditions

India's experience suggests three broad pathways that can be considered by other countries.

Agricultural-energy context	Potential model	Critical preconditions
Remote or off-grid farming; diesel pumping; costly grid extension	Stand-alone solar water pump	Sustainable water source, correct system sizing, farmer affordability, O&M and service network
Existing grid-connected individual pumps	Individual pump solarisation	Reliable metering, export/settlement framework where surplus energy is sold, distribution-system readiness
Concentrated agricultural demand served through identifiable feeders or substations	Feeder/community-level solarisation	Suitable distribution architecture, demand data, land, grid capacity, bankable power-offtake arrangements

The Guidebook makes an important distinction between individual and feeder-level approaches. Individual pump solarisation places more technical and behavioural responsibility at the farm level, whereas feeder-level solarisation centralises many implementation and operating responsibilities with the utility and developer. This can reduce the transaction burden associated with managing very large numbers of dispersed individual systems. Countries should consequently avoid treating the choice between stand-alone pumps, individual solarisation and feeder/community solutions as merely a technology decision. It is fundamentally a programme architecture and risk-allocation decision.

6.4 Lesson 3: Scale follows risk reduction

One of the strongest messages emerging from the Maharashtra experience in the Guidebook is that scale follows risk reduction. Instead of leaving every developer to separately resolve land, approvals, connectivity and payment concerns after project award, these issues were progressively brought upstream into programme development.

This principle is directly transferable internationally.

Before large procurement is launched, an implementing agency should progressively establish:

Project readiness: validated demand, locations, system sizing, resource availability and technical feasibility.

Land readiness: where common solar plants are envisaged, land availability, title, accessibility and evacuation routes should be assessed before procurement.

Grid readiness: transformer capacity, available bays, protection requirements, voltage level, evacuation arrangements and the ability of the network to absorb solar generation should be assessed in advance.

Regulatory readiness: tariff methodology, procurement route, licensing requirements, power-purchase arrangements and treatment of surplus energy should be reasonably clear before bidders commit capital.

Commercial readiness: contractual responsibilities, payment arrangements and risk allocation should be established sufficiently early to make projects financeable.

The Guidebook's recommended implementation framework formalises this sequence—**Planning → Development → Procurement & Contracting → Execution**—with risks progressively removed at each stage rather than transferred indiscriminately to the successful bidder.

This is perhaps the most important lesson that can be transferred from India: **countries should procure projects that have been developed, rather than merely procure equipment and expect project development to follow.**

6.5 Lesson 4: Financing must address affordability and project bankability separately

India's experience also demonstrates that farmer affordability and project bankability are important problems to be addressed.

For individual solar pumps, capital subsidy, beneficiary contribution and access to financing have been combined to reduce the upfront burden on farmers. Under the current PM-KUSUM structure, the Government of India provides defined central financial assistance, with state support and farmer contribution forming the remaining financing structure.

For feeder-level projects, the Guidebook demonstrates another approach. Under a RESCO structure, private developers can finance, construct and operate solar assets and recover investment through a long-term power-purchase arrangement. This reduces the requirement for upfront public capital, but only where tariffs, contracts, land, connectivity and payment arrangements are sufficiently credible.

The Maharashtra and Rajasthan experiences further show the importance of **payment security.** Letters of Credit, escrow mechanisms and revolving payment-security arrangements were used to reduce counterparty risk and strengthen developer and lender confidence.

For other countries, while the precise financing instrument would differ, the principle, which can be applied, is that government support should be directed towards the risk that prevents deployment—whether that is farmer affordability, cost of finance, utility payment risk, or project-development risk — rather than assuming that capital subsidy alone will create a sustainable market.

6.6 Lesson 5: Use programme scale to build local manufacturing and value addition

India's experience also points to the importance of linking programme scale with a local supply and service ecosystem. Large and predictable deployment volumes can support local assembly and manufacturing of pumps, motors, controllers, mounting structures and, where economically viable, solar components, alongside local testing, installation and maintenance capability.

Localisation is relevant not only as an country policy objective, but also to the delivered cost of solar pumping. Local value addition can reduce exposure to freight, import duties, foreign-exchange movements and long replenishment cycles, while standard specifications and aggregated procurement can create economies of scale and improve the availability of spare parts and service support.

The Guidebook notes the expansion of India's domestic solar manufacturing ecosystem as an element of energy security and supply-chain resilience. For Member Countries, localisation should reflect programme volume, market size, industrial capability and quality-assurance systems. A phased pathway - from local installation and servicing, to assembly, and then component manufacturing as volumes grow - may often be more practical than requiring full localisation at the outset.

The transferable lesson is to consider the delivered and lifecycle cost of solar pumps, and use programme scale to build local value addition, skills and after-sales capability where economically viable.

6.7 Lesson 6: Treat O&M and after-sales service as part of programme design

Large-scale solar-pump programmes cannot be evaluated simply by the number of systems installed.

A dispersed pumping programme eventually becomes a **service-management programme.** Farmers require access to trained technicians, spare parts, warranty enforcement and timely resolution of pump, controller, inverter or module failures.

The Maharashtra off-grid pump programme examined in the Guidebook provides for a **five-year Comprehensive Maintenance Contract,** alongside digital monitoring of material inspection and vendor progress. The programme design therefore connects procurement with post-installation service responsibility rather than treating commissioning as the end of the intervention. For countries seeking large-scale deployment, vendor qualification and procurement should consequently specify:

technical standards and system performance; installation quality; commissioning and acceptance testing; warranty obligations; local service coverage; response times and grievance resolution; availability of critical spares; and monitoring of operational systems after installation.

A lower equipment price without reliable lifecycle support can ultimately increase the cost of the programme and undermine farmer confidence.

6.8 Lesson 7: Digital systems become essential when deployment reaches scale

The Indian state programmes documented in the Guidebook progressively moved from fragmented administrative processes towards digital programme management.

Digital tools have been used for land databases, project monitoring, milestone tracking, approvals, metering, billing and performance monitoring. The recommended framework consequently calls for central milestone monitoring during execution and, after commissioning, remote metering, data reconciliation and contract-performance monitoring.

For Member Countries, a digital platform need not initially be sophisticated. However, a scalable programme should progressively establish a unique identity for each installation or project and retain information on beneficiary, location, water source, pump and PV specifications, vendor, commissioning, warranty, maintenance history and operational status.

Such a system converts deployment statistics from a count of equipment supplied into a **programme-level monitoring and verification framework.**

6.9 Lesson 8: Farmers and local communities are programme stakeholders, not merely beneficiaries

Both the Maharashtra and Rajasthan experiences show the importance of stakeholder engagement.

The Guidebook identifies sustained Information, Education and Communication (IEC) activities, consultation with farmers and landowners, engagement with local administrations and clear communication of land and benefit arrangements as important implementation enablers. Rajasthan's experience specifically records that continuous IEC helped build trust, reduce misinformation and improve local participation. During the programme implementation of PM-KUSUM in India, creation of awareness among farmers was an important part of the implementation chain.

For international deployment, farmer engagement should therefore start before procurement. Farmers need to understand the expected irrigation service, ownership and maintenance responsibilities,



financial contribution where applicable, water-use implications and grievance mechanism.

Where community land or common infrastructure is involved, local institutions should similarly have a defined role. The underlying lesson from India is that local acceptance cannot be treated as an administrative clearance to be obtained after project award; it is part of project development.

6.10 Lesson 9: Solar irrigation must be designed through the water-energy-food nexus

Solar pumping can materially reduce the operating cost of irrigation. That is one of its principal benefits, but it can also change the economics of groundwater extraction.

The Guidebook therefore cautions that stand-alone solar pumps should be deployed with groundwater safeguards and that programmes should consider groundwater conditions, crop choices and irrigation efficiency rather than treating solar pumping exclusively as an energy-access intervention.

For countries experiencing water stress, programme design should consequently connect energy planning with the responsible ministry or agency for agriculture and water. Pump sizing should reflect actual water requirement, source characteristics and pumping head rather than simply the maximum capacity affordable under a subsidy programme.

Where appropriate, solar irrigation can also be accompanied by efficient irrigation practices and farmer awareness on water conservation.

Thus, the objective should not be **maximum pumping from solar energy, but productive and sustainable agricultural use of solar-powered water.**



6.11 Lesson 10: Build from solar pumps to solarisation of the wider agricultural value chain

A further lesson being carried into the next generation of programme design in India is that solar pumping should be treated as an entry point rather than the end point of agricultural solarisation. The ecosystem created around pumps - farmer awareness, vendor networks, financing channels, technical standards, digital monitoring and local service capability - can support wider productive uses of solar energy across agriculture.

These applications can include solar-powered cold storage, drying, milling, processing and other farm and post-harvest energy uses. They can also include Agrivoltaics (AgriPV), where solar generation and agricultural production are combined on the same land. Where local crop, land, water and market conditions are suitable, such applications can increase value addition, land-use productivity and farmer income.

Not every solar-pump programme should automatically expand into every adjacent application; each requires its own demand assessment, business model, technical standards and safeguards. The opportunity is to reuse the institutional, financing, procurement, service and monitoring architecture already created, thereby reducing the transaction cost of moving into related agricultural solar applications.

For Member Countries, this suggests a possible progression from solar pump deployment to solar-powered farms and, ultimately, to solarisation of the agricultural value chain.

6.12 What should—and should not—be replicated from India

The Indian experience provides a rich implementation reference, but several parameters in PM-KUSUM and the state programmes are necessarily India-specific. These include subsidy percentages, permissible pump capacities, Central Financial Assistance, electricity-sector regulations, particular voltage thresholds, prescribed lease rates, specific payment-security structures and institutional arrangements involving Indian DISCOMs and state agencies.

These parameters should not be mechanically exported. What is transferable is the underlying architecture:

diagnose first → select the appropriate model → develop projects before procurement → allocate risks clearly → make financing bankable → procure competitively → build local value and service ecosystems where viable → ensure O&M → monitor digitally → engage farmers and communities → protect the water resource → expand progressively across the agricultural value chain.

The objective of international replication should be to transfer **institutional learning and implementation discipline, not Indian administrative rules.**





6.13 The central message

India's experience demonstrates that the scaling challenge in solar irrigation is no longer principally about proving that solar pumps work.

It is about building an ecosystem in which the right system is installed for the right agricultural requirement; projects are technically and commercially prepared before procurement; farmers can afford and maintain the systems; investors and utilities can manage their risks; institutions can monitor performance; and increased access to energy does not lead to unsustainable use of water. As programmes mature, that ecosystem should also lower delivered costs through appropriate local value addition and provide a platform for wider solarisation of agricultural activities.

The most valuable lesson from PM-KUSUM and the state experiences documented in this Guidebook is therefore not a particular subsidy level, tender format or technical configuration.

It is the transition from installing solar pumps to building a scalable solar-irrigation programme—and, over time, using that programme ecosystem to solarise the wider agricultural value chain.





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