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An Economic Study of PM Surya Ghar Yojana with Special Reference to Rajasthan

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ABSTRACT: The PM Surya Ghar: Muft Bijli Yojana is one of India's largest renewable energy and household electrification initiatives. Launched in February 2024 by the Government of India, the scheme aims to provide rooftop solar systems to one crore households and ensure affordable electricity access through decentralized solar power generation. Rajasthan, due to its high solar radiation, large geographical area, and renewable energy potential, has emerged as an important state in the implementation of the scheme. This research article examines the economic, social, and geographical dimensions of the PM Surya Ghar Yojana in Rajasthan till February 2025. The study analyses subsidy patterns, employment generation, reduction in electricity expenditure, environmental benefits, institutional mechanisms, and implementation challenges. Secondary data from government reports, Ministry of New and Renewable Energy (MNRE), energy agencies, newspapers, and policy documents have been used. The article finds that the scheme has accelerated rooftop solar adoption, reduced household energy costs, promoted green employment, and strengthened Rajasthan's renewable energy economy. However, issues such as financing constraints, awareness gaps, technical barriers, and uneven regional distribution remain important concerns. The study concludes that Rajasthan can become a national leader in decentralized solar energy if policy coordination, infrastructure support, and public awareness are strengthened.

KEYWORDS: PM Surya Ghar Yojana, Rajasthan, Rooftop Solar Energy, Renewable Energy, Sustainable Development, Green Economy, Electricity Subsidy, Solar Power.

I. INTRODUCTION

India is one of the fastest-growing economies in the world, and its energy demand has increased rapidly due to industrialization, urbanization, population growth, and rising living standards. Conventional energy resources such as coal, petroleum, and natural gas have created environmental and economic challenges including pollution, greenhouse gas emissions, and dependence on imports. Therefore, renewable energy has become an essential component of India's energy policy.

Among renewable sources, solar energy has emerged as the most promising option because India receives abundant sunlight throughout the year. Rajasthan possesses the highest solar potential in India due to its desert climate, large open land area, and high solar irradiation. Recognizing this potential, the Government of India launched the PM Surya Ghar: Muft Bijli Yojana in February 2024.

The scheme aims to:

- Provide rooftop solar systems to households.
- Reduce electricity bills.
- Increase renewable energy generation.
- Promote sustainable development.
- Generate employment in the solar sector.
- Reduce carbon emissions.

The scheme offers subsidies for residential rooftop solar installations and encourages households to produce electricity independently through solar panels. Under the scheme, consumers can receive subsidies up to ₹78,000 for rooftop systems up to 3 kW capacity.



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Rajasthan plays a significant role in the implementation of the scheme because of:

- Strong solar potential,
- Availability of land,
- Existing renewable energy infrastructure,
- Government support for solar projects.

The present study examines the economic significance and implementation status of PM Surya Ghar Yojana in Rajasthan till February 2025.

II. OBJECTIVES OF THE STUDY

The major objectives of the study are:

1. To examine the features and objectives of PM Surya Ghar Yojana.
2. To analyse the economic importance of rooftop solar energy in Rajasthan.
3. To study the implementation status of the scheme in Rajasthan till February 2025.
4. To evaluate the socio-economic and environmental impacts of the scheme.
5. To identify the challenges and policy issues related to implementation.
6. To suggest measures for effective implementation of the scheme in Rajasthan.

III. RESEARCH METHODOLOGY

The study is based on secondary data collected from:

- Ministry of New and Renewable Energy (MNRE),
- Government reports,
- Rajasthan Renewable Energy Corporation Limited (RRECL),
- Research journals,
- Newspapers,
- Energy policy reports,
- Official statistics and websites.

The study uses descriptive and analytical methods for interpretation of data related to rooftop solar installations, subsidies, electricity savings, and employment generation.

IV. OVERVIEW OF PM SURYA GHAR YOJANA

4.1 Launch and Background

The PM Surya Ghar: Muft Bijli Yojana was launched in February 2024 by the Government of India to promote residential rooftop solar systems. The scheme aims to provide free electricity benefits to households through decentralized solar generation. The scheme targets installation of rooftop solar systems in one crore households by 2027.

4.2 Major Features of the Scheme

Feature	Description
Launch Year	2024
Target	1 crore households
Nodal Ministry	Ministry of New and Renewable Energy
Type	Residential rooftop solar scheme
Maximum Subsidy	₹78,000
Main Objective	Affordable electricity and renewable energy
Financing	Subsidy + bank loan support
Beneficiaries	Residential electricity consumers



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4.3 Subsidy Structure

Rooftop Solar Capacity	Subsidy Amount
Up to 2 kW	₹30,000 per kW
Additional capacity up to 3 kW	₹18,000 per kW
Maximum subsidy	₹78,000

V. RAJASTHAN AND SOLAR ENERGY POTENTIAL

5.1 Geographical Advantages

Rajasthan possesses excellent conditions for solar energy generation due to:

- High solar radiation,
- Large desert areas,
- Low rainfall,
- Clear sky conditions,
- Vast unused land.

The western districts such as Jaisalmer, Barmer, Bikaner, Jodhpur, and Jalore are highly suitable for solar power generation.

5.2 Solar Energy Capacity in Rajasthan

Rajasthan is among the leading solar energy producing states in India. The state contributes significantly to India's renewable energy capacity and hosts several large solar parks.

Table: Advantages of Rajasthan for Solar Development

Factor	Importance
High solar radiation	Better electricity generation
Desert climate	More sunny days
Large land availability	Suitable for solar parks
Government support	Faster investment
Renewable energy infrastructure	Easier implementation

VI. PROGRESS OF PM SURYA GHAR YOJANA IN RAJASTHAN

The implementation of PM Surya Ghar Yojana has expanded rapidly in Rajasthan due to rising public awareness and government support.

According to available reports, Rajasthan became one of the leading states in rooftop solar adoption under the scheme. By late 2025, Rajasthan had crossed more than one lakh rooftop solar installations.

Table: Rajasthan's Progress under PM Surya Ghar Scheme

Indicator	Status
Rooftop solar installations	More than 1 lakh
Beneficiary households	More than 1.2 lakh
Subsidy disbursed	More than ₹800 crore
Major DISCOM areas	Jaipur, Jodhpur, Ajmer



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VII. ECONOMIC IMPACT OF PM SURYA GHAR YOJANA

7.1 Reduction in Electricity Expenditure

The scheme significantly reduces household electricity bills. Households generating solar power can consume their own electricity and sell excess electricity to the grid through net metering.

Average annual savings for households are estimated between ₹15,000–₹18,000 depending on consumption and system size.

7.2 Employment Generation

The scheme has generated employment in:

- Solar panel manufacturing,
- Installation services,
- Maintenance services,
- Electrical engineering,
- Technical consultancy.

Table: Employment Areas under the Scheme

Sector	Employment Opportunity
Manufacturing	Solar panels and components
Installation	Rooftop system setup
Maintenance	Repair and servicing
Finance	Solar loan processing
Technical Services	Inspection and approval

7.3 Growth of Green Economy

- The scheme contributes to:
- Sustainable economic growth,
- Renewable energy investment,
- Green infrastructure development,
- Energy self-reliance.

It also reduces dependence on imported fossil fuels.

VIII. ENVIRONMENTAL IMPACT

The PM Surya Ghar Yojana contributes to environmental sustainability through reduction in carbon emissions and promotion of clean energy.

- Major Environmental Benefits
- Reduction in greenhouse gas emissions,
- Lower air pollution,
- Reduced coal dependency,
- Climate change mitigation,
- Sustainable urban energy systems.

The scheme is expected to reduce large quantities of CO₂ emissions over the lifetime of rooftop systems.

IX. SOCIAL IMPACT OF THE SCHEME

9.1 Improvement in Living Standards

- Households benefit through:
- Lower electricity costs,
- Better energy security,
- Reliable electricity supply,
- Increased disposable income.



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9.2 Rural Development

Rooftop solar systems support rural development by:

- Providing reliable electricity,
- Reducing power shortages,
- Supporting digital education,
- Promoting small businesses.

9.3 Women Empowerment

Reduced electricity expenditure and improved energy availability indirectly support women through:

- Better household management,
- Small-scale enterprises,
- Improved quality of life.

X. INSTITUTIONAL FRAMEWORK

The implementation of PM Surya Ghar Yojana involves multiple institutions.

Table: Institutional Structure

Institution	Role
MNRE	Policy formulation
DISCOMs	Grid connection
Banks	Loan support
Vendors	Installation
State agencies	Monitoring and implementation

XI. RAJASTHAN DISCOM PERFORMANCE

The three major DISCOMs in Rajasthan are:

1. Jaipur DISCOM,
2. Jodhpur DISCOM,
3. Ajmer DISCOM.

These DISCOMs play an important role in:

- Net metering approvals,
- Feasibility checks,
- Grid integration,
- Subsidy verification.

Reports indicate significant participation across all DISCOM regions.

XII. FINANCIAL ANALYSIS OF ROOFTOP SOLAR SYSTEMS

Example of Household Solar Economics

Item	Approximate Value
Rooftop Solar System Cost (3 kW)	₹1.5–2 lakh
Government Subsidy	Up to ₹78,000
Net Cost to Consumer	₹70,000–1 lakh
Annual Savings	₹15,000–18,000
Payback Period	4–6 years



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XIII. CHALLENGES IN RAJASTHAN

Despite significant progress, several challenges remain.

13.1 Financial Constraints

Many households still find rooftop solar systems expensive despite subsidies.

13.2 Lack of Awareness

Rural and low-income households often lack information regarding: Subsidy procedures, Installation process and technical requirements.

13.3 Technical Challenges

Problems include:

- Roof suitability,
- Grid connectivity,
- Maintenance issues,
- Vendor quality concerns.
- Poor installation quality has also been reported in some cases.

13.4 Administrative Delays

Consumers sometimes face delays in:

- Subsidy approval,
- Net metering,
- Inspection,
- Loan sanctioning.

XIV. COMPARATIVE POSITION OF RAJASTHAN

Although Gujarat remained the leading state in rooftop solar adoption, Rajasthan emerged among the top-performing states under the scheme.

Table: Comparative State Performance

State	Approximate Installations
Gujarat	Highest
Maharashtra	Second
Uttar Pradesh	Third
Kerala	Fourth
Rajasthan	Among Top Five

XV. SWOT ANALYSIS OF PM SURYA GHAR YOJANA IN RAJASTHAN

Strengths	Weaknesses
High solar potential	Initial investment cost
Strong government support	Awareness gaps
Renewable energy infrastructure	Technical barriers
Employment generation	Administrative delays
Opportunities	Threats
Green economy growth	Vendor quality issues
Rural electrification	Climate-related damage



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Energy self-reliance	Financing challenges
Export potential	Policy uncertainty

XVI. POLICY SUGGESTIONS

To improve implementation in Rajasthan, the following measures are recommended:

1. Increase public awareness campaigns.
2. Simplify subsidy procedures.
3. Improve loan accessibility.
4. Strengthen technical training.
5. Ensure quality standards for vendors.
6. Expand rural outreach programs.
7. Improve DISCOM efficiency.
8. Encourage local manufacturing.
9. Develop solar skill training centres.
10. Promote women participation in solar entrepreneurship.

XVII. FUTURE PROSPECTS

The future of rooftop solar energy in Rajasthan is highly promising because:

- Electricity demand is increasing,
- Solar technology costs are declining,
- Government support is expanding,
- Climate change concerns are rising.

Rajasthan can become India's leading decentralized solar economy through:

- Wider rooftop adoption,
- Better financing,
- Smart grid integration,
- Community solar systems.

XVIII. CONCLUSION

The PM Surya Ghar: Muft Bijli Yojana represents a transformative step toward sustainable energy development in India. Rajasthan, with its immense solar potential and favourable geographical conditions, has become an important state in the implementation of the scheme.

The study reveals that the scheme has:

- Reduced household electricity costs,
- Increased renewable energy adoption,
- Generated employment,
- Supported environmental sustainability,
- Strengthened the green economy.

At the same time, issues related to financing, awareness, technical capacity, and administrative efficiency continue to affect implementation. With improved policy coordination and infrastructure development, Rajasthan can emerge as a model state for decentralized renewable energy systems.

The PM Surya Ghar Yojana is not only an energy initiative but also a socio-economic transformation programme that supports sustainable development, inclusive growth, and energy security.



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