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YOJANA MAGAZINE ANALYSIS

(February 2025)

(Part 1/4)

TOPICS TO BE COVERED

PART 1/4

- PM KUSUM: EMPOWERING FARMERS WITH SOLAR ENERGY
- ENERGY SECURITY IN INDIA

PART 2/4

- INDIAN CARBON MARKETS
- SMART CITIES MISSION & ROLE OF ENERGY EFFICIENCY

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- SCOPE & OPPORTUNITIES FOR RENEWABLE ENERGY IN RURAL INDIA
- GREEN HYDROGEN

PART 4/4

- BIOFUELS AS A PROMISING SUBSTITUTE FOR HIGH CARBON ENERGY SOURCE
- PRAGATI: DRIVING INDIA'S DEVELOPMENT WITH PURPOSE

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PM KUSUM: EMPOWERING FARMERS WITH SOLAR ENERGY

- Agriculture is a cornerstone of India's economy, ensuring food security, employment, and economic growth.
- However, the sector faces challenges such as dependency on fossil fuels, high electricity costs, and groundwater depletion.
- To address these issues and promote sustainable practices, the **Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM)** was launched in **March 2019**.
- The primary goal of this initiative is to integrate **solar energy** into farming, thereby boosting agricultural productivity while reducing environmental impact.
- As of now, India has installed over **5,02,000 solar pumps**, cutting down **CO2 emissions** by **1.02 million tonnes** annually.

ENERGY USE IN AGRICULTURE

- Agriculture in India has traditionally relied on groundwater for irrigation, especially since the **Green Revolution**, which expanded the irrigated area.

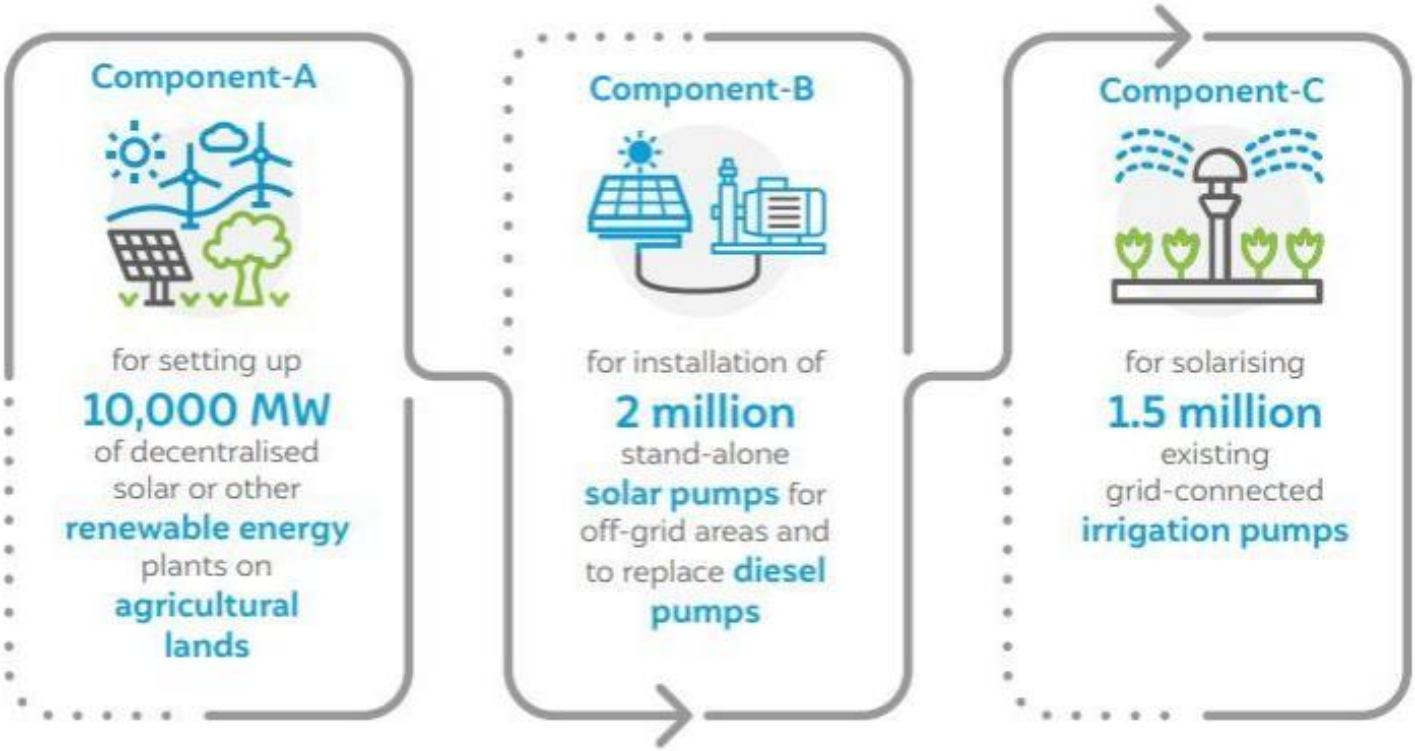
- While this has helped increase agricultural productivity, the reliance on **diesel-powered** pumps and **electricity** for irrigation has significantly contributed to **rising energy consumption**.
- In fact, energy use in agriculture now accounts for **8-11%** of India's total carbon emissions.
- In recent years, **subsidized electricity** for farmers has further exacerbated the problem.
- While it supports farmers in the short term, it has led to **over-extraction of groundwater**, which is a growing concern for long-term water security and agricultural sustainability.
- As the demand for energy in farming increases, there is a pressing need for cleaner, more efficient energy sources.

OBJECTIVES & COMPONENTS

The **PM-KUSUM scheme** aims to achieve **34.8 GW** of solar capacity installation by **March 2026**. The initiative is structured into three key components:

- **Component-A**: **Solar Power Plants** (500 kW to 2 MW) will be set up to provide clean energy and reduce dependency on conventional grid power.

- **Component-B**: **Standalone Solar-Powered Irrigation Pumps** will be installed to help farmers who lack access to reliable power sources. These pumps operate independently of the grid, reducing operational costs.
- **Component-C**: **Solarising Existing Grid-Connected Irrigation Pumps** involves converting conventional electric pumps into solar-powered ones, thus reducing the electricity load on the national grid.



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BENEFITS OF SOLAR POWERED IRRIGATION

Solar-powered irrigation has multiple benefits for farmers and the environment:

- **Reduced reliance on fossil fuels**: Solar energy is renewable and can replace diesel-powered pumps, which are costly and polluting.
- **Lower operational costs**: After the initial investment, the cost of running a solar pump is much lower than conventional pumps powered by electricity or diesel.
- **Reduced carbon emissions**: Solar energy is clean, helping reduce carbon footprints and contributing to climate mitigation.
- **Enhanced farm income**: Solar pumps can help ensure a stable water supply, improving crop yields and, consequently, farm income.
- **Improved energy efficiency**: Solar-powered systems optimize energy use, leading to better efficiency and sustainable farming practices.
- **User-friendly operation**: Solar pumps are easy to maintain and operate, reducing the workload on farmers.

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CHALLENGES & OPPORTUNITIES

Despite the numerous benefits, there are challenges to adopting solar-powered irrigation systems:

1. **High Upfront Costs**: The initial investment required for installing solar systems can be a barrier, especially for small farmers.
2. **Difficulty in Accessing Credit**: Many farmers face difficulties in accessing finance, especially in rural areas where financial institutions are less accessible.
3. **Electricity Subsidies**: Subsidized electricity for farmers discourages the adoption of solar pumps since it makes the transition to solar less financially appealing.
4. **Groundwater Over-Extraction**: There are concerns that the widespread installation of solar pumps could lead to the over-extraction of groundwater if not managed properly.
5. **Institutional Gaps**: There is lack of institutional mechanisms for integrating solar pumps with water-saving technologies.
6. **Regional Variations**: The uptake of solar-powered irrigation varies across different regions, often influenced by factors like solar radiation, financial resources, and local awareness.

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CONCLUSION

The **PM-KUSUM** scheme holds great promise for transforming India's agricultural landscape by integrating **solar energy** into farming. It offers an opportunity to reduce dependence on fossil fuels, lower operational costs for farmers, enhance agricultural productivity, and contribute to environmental sustainability.

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ENERGY SECURITY IN INDIA: ADVANCING RENEWABLE ENERGY & SUSTAINABILITY THROUGH KEY GOVT. INITIATIVES

- India's energy security is a fundamental aspect of its economic growth and sustainability.
- To reduce dependence on fossil fuels and promote a cleaner energy future, the government has rolled out numerous initiatives focused on renewable energy, grid stability, and carbon emission reductions.
- As of **January 2025**, India's **total non-fossil fuel-based energy capacity** has reached **217.62 GW**, marking a significant achievement toward energy security.
- Key initiatives, such as the **National Bio Energy Mission**, **National Green Hydrogen Mission**, **PM-KUSUM**, and **PM Surya Ghar Muft Bijli Yojana**, are at the forefront of this transition.
- These programs are contributing to both **economic growth** and **environmental sustainability**.

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RENEWABLE ENERGY CAPACITY IN INDIA

India has significantly advanced its renewable energy capacity, as demonstrated:

Sector	Installed Capacity (MW)
Wind Power	48,163.16
Solar Power	97,864.72
Small Hydro Power	5,100.55
Biomass Cogeneration (Bagasse)	9,806.42
Biomass Cogeneration (Non-Bagasse)	921.79
Waste to Power	249.74
Waste to Energy (Off-grid)	370.20
Total Renewable Energy Capacity	162,476.58

THE CDCC INITIATIVE

The **Centralized Data Collection and Coordination (CDCC) Wind Initiative**, launched in **June 2020**, aims to enhance wind energy development by improving wind resource assessment through accurate data collection and research.

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Objectives

- **Facilitate wind energy development** by providing detailed wind resource maps.
- **Support site identification** for efficient wind energy projects.
- **Encourage private sector investments** and public-private partnerships.

KEY ACHIEVEMENTS

- Established **over 800 wind-monitoring stations** across India.
- The initiative has contributed to a **30% increase in India's wind energy capacity**, growing from **21.04 GW** in **2014** to **48.16 GW** in **2025**.
- The **Union Cabinet** approved a **Viability Gap Funding (VGF)** scheme of **₹7,453 crores** for offshore wind energy projects off the coasts of **Gujarat** and **Tamil Nadu**.

NATIONAL GREEN HYDROGEN MISSION

- Launched in **January 2023**, the **National Green Hydrogen Mission** focuses on **green hydrogen production** to reduce India’s dependency on fossil fuels and position the country as a leader in **global green hydrogen markets**.

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Objectives

- Position India as the leading **global producer and supplier** of green hydrogen.
- **Create export opportunities** for hydrogen and its derivatives.
- **Develop indigenous manufacturing capabilities** for hydrogen technologies.

KEY ACHIEVEMENTS

- **₹19,744 crore** allocated for infrastructure and technology development.
- Over **₹8 lakh crore** in investments aimed at reaching **5 million metric tons** of green hydrogen capacity by **2030**.
- **Selection of manufacturers** for **1,500 MW electrolyser capacity**.
- India hosted key international events like the **International Conference on Green Hydrogen (ICGH - 2023)** in New Delhi and **41st IPHE Meeting** to foster collaboration on clean hydrogen technologies.

NATIONAL SOLAR MISSION

- The **National Solar Mission** (NSM), launched in **2010**, is one of India's flagship programs aimed at promoting **solar energy** adoption and addressing energy security challenges.

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Objectives

- Establish India as a **global leader** in solar energy.
- Achieve **50% of the total electric power capacity** from **non-fossil fuel-based resources** by 2030.
- Support **solar technology diffusion** across the country.

KEY ACHIEVEMENTS

- **Solar power capacity** increased from **9.01 GW (2016)** to **97.86 GW (2025)**.
- India ranked **5th globally** in solar power deployment.
- Installation of **58 solar parks** with a **40 GW sanctioned capacity** (up from **34 parks** and **20 GW** in 2016).
- **Rooftop solar capacity** grew from **90.8 MW (2016)** to **11,503 MW (2024)**.
- As of March 2024, the **solar potential** of India stood at **748.98 GW**.

PM SURYA GHAR MUFT BIJLI YOJANA

- Launched in **February 2024**, the **PM Surya Ghar Muft Bijli Yojana** is the world's largest **domestic rooftop solar initiative**.
- The goal is to provide solar panels for **one crore households** by **March 2027**.

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Objectives

- Encourage **rooftop solar adoption** in residential sectors.
- Provide **financial incentives and subsidies** for solar installations.
- Allow households to **generate their own electricity**, reducing dependency on the grid.

KEY ACHIEVEMENTS

- **7 lakh rooftop solar installations** completed within **10 months** of the scheme's launch.
- **States like Gujarat**, **Maharashtra**, **Kerala**, and **Uttar Pradesh** have made significant progress, showcasing strong infrastructure and collaboration.
- A **20-30% reduction in electricity bills** for households with solar panels.
- The **Model Solar Village** scheme, with an **₹800 crore outlay**, supports villages in promoting solar energy adoption, encouraging self-reliance in energy.

CONCLUSION

India's journey toward achieving **energy security** is propelled by an ambitious and dynamic renewable energy strategy. With significant investments and a range of government schemes such as the **National Green Hydrogen Mission**, **PM-KUSUM**, **National Solar Mission**, and **PM Surya Ghar Muft Bijli Yojana**, India is making remarkable strides in its clean energy transition.