Rooftop Solar in India's Energy Sector

For Prelims: **India's rooftop solar (RTS)**, **India's energy sector**, **photovoltaic panels** **Council on Energy, Environment and Water (CEEW)**, **Ministry of New and Renewable Energy (MNRE)**, **fossil fuels and energy imports**, **PM Surya Ghar Muft Bijli Yojana**, **UN Sustainable Development Goals**.

For Mains: Significance of Rooftop Solar in India's Energy Sector.

Source: TH

Why in News?

As of March 2024, **India's total installed rooftop solar (RTS) capacity** stood at **11.87 gigawatts (GW)**, with a notable increase of **2.99 GW in installed capacity** during 2023-2024. This highlights the substantial transformative potential of RTS within **India's energy sector.**

What is the Rooftop Solar Programme?

- **About:**
    - The government introduced the **Rooftop Solar Programme in 2014** to promote rooftop solar installation.
    - The original target was **40 GW installed capacity (out of 100 GW by 2030) by 2022** but the goal was not met by 2022, the deadline was **extended to 2026.**
        - Rooftop solar panels are **photovoltaic panels** installed on the roof of a building and connected to the main power supply unit.
- **Objective:**
    - To promote **grid-connected solar rooftop systems** on residential buildings.
- **Historical Context:**
    - This program was launched as part of the **Jawaharlal Nehru National Solar Mission in 2010,** the Initial target was **20 GW of solar energy by 2022** then the revised target was **100 GW by 2022,** including 40 GW from RTS.
- **Key Initiatives under Rooftop Solar:**
    - **SUPRABHA** (Sustainable Partnership for RTS Acceleration in Bharat).
    - **SRISTI (**Sustainable Rooftop Implementation for Solar Transfiguration of India).
- **Implementation and State Performance**:
    - Centrally driven by the **Ministry of New and Renewable Energy (MNRE)** and executed through state nodal agencies and power distribution companies.
        - **Top performers States:** Gujarat, Maharashtra, Rajasthan.
        - **Moderate performers:** Kerala, Tamil Nadu, Karnataka.
        - **Underperformers:** Uttar Pradesh, Bihar, Jharkhand.

What is the Significance of the Rooftop Solar Programme?

- **Decentralised Energy Production: It reduces dependency on centralized power grids and enhances energy security and resilience by installing rooftop solar panels in targeted households.**

- Economic Advantages: It lowers electricity bills for consumers, creates jobs in the solar industry, and reduces the need for expensive grid infrastructure upgrades.

- **Energy Independence:** It empowers consumers to become 'prosumers' (producers and consumers) and reduces reliance on **fossil fuels and energy imports.**
- **Rural Electrification and Energy Diversification: It provides power to remote areas not connected to the main grid, improves the quality of life in underserved communities, and contributes to a more diverse and stable energy mix.**
- **Sustainable Development:** It aligns with **UN Sustainable Development Goals (SDG 7)** and supports India's commitment to renewable energy and climate action.

What is India’s Current Solar Capacity?

- **India's Rooftop Solar Capacity:**
  - **India's total installed rooftop solar capacity** is reported to be approximately 11.87 GW, with Gujarat leading the table followed by Maharashtra, **as of March 2024.**
    - The overall **RTS potential of India** is approximately **796 GW.**
  - According to a **Council on Energy, Environment and Water (CEEW)** report, only **20% of rooftop solar installations** are currently in residential sectors, with the majority **concentrated in commercial and industrial sectors.**
  - The CEEW report projects that **India's 250 million households have the potential** to collectively install up to 637 GW of rooftop solar capacity, which could potentially fulfil **one-third of the country's** residential electricity demand.
- **Total Installed Capacity:**
  - Regarding total solar capacity, the **Ministry of New and Renewable Energy** states that India had achieved approximately **73.31 GW by December 2023**, with Rajasthan leading at **18.7 GW and Gujarat following at 10.5 GW**.

Note

- **Modhera, India’s first solar-powered village**, is in Gujarat and has 1,300 **RTS systems of 1 kW each.**

What is PM Surya Ghar Muft Bijli Yojana?

- **About:**

  - The PM Surya Ghar Muft Bijli Yojana is a scheme aimed at providing RTS systems in 1 crore households.

  - Under this initiative, participating households can receive 300 units of electricity free every month.

  - The scheme targets residential consumers with systems up to 3 kW capacity, covering a majority of households in India.

- **Registration and Installation:**

    - To initiate the installation, interested residents must register on the **national rooftop solar portal** and select a vendor from the provided list.
    - Eligibility requires a valid electricity connection and no prior subsidy availed for solar panels.
- **Financial Setup:**
    - The scheme is financed with a central allocation of Rs 75,021 crore, primarily distributed as direct subsidies to consumers.
    - It also includes provisions for **payment security in renewable energy service company models and supports innovative projects.**
- **Key Benefits:**
    - It includes **free electricity, reduced electricity bills**, payback periods ranging from **three to seven years,** lower costs for the government, increased adoption of renewable energy, and decreased carbon emissions.

What are the Other Government Initiatives to Harness Solar Energy?

- **FDI in Renewable Energy:** Permitting up to **100% FDI under the automatic route** for renewable energy projects.
- One Sun, One World, One Grid
- **Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA)**
- Green Energy Corridor (GEC)
- National Smart Grid Mission (NSGM) and Smart Meter National Programme
- International Solar Alliance (ISA)
- National Solar Mission
- Solar Park Scheme
- Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM)

What are the Different Challenges and Way Forward Related to RTS?

Challenges	Way Forward
▪ **High Initial Costs:** A typical 3 kW residential system costs around Rs. 1.5-2 lakhs (before subsidies) and Commercial installations can cost Rs. 40-50 per watt.	▪ **Policy Reforms:** Expand and Simplify Subsidies, increase subsidy coverage for larger systems, and streamline the subsidy disbursement process ▪ **Innovative Financing Models:** Promote solar leasing and power purchase agreements (PPAs) les.
▪ **Limited Awareness:** Only 20% of RTS installations are in the residential sector (CEEW report) which poses a significant hurdle to its installation in rural sectors.	▪ **Awareness and Outreach:** Launch comprehensive public awareness campaigns. And leverage social media and community engagement programs.

▪ **Grid Integration Challenges:** In India, states like Rajasthan, Gujarat, and Tamil Nadu face **issues with grid stability due to intermittent solar generation.**	▪ **Grid Modernization: Invest in smart grid technologies to better integrate distributed solar generation.** ▪ **Promote energy storage solutions to address intermittency issues.** ▪ **Develop better forecasting and management systems for solar power**
▪ **Limited Skilled Workforce:** India needs an estimated **300,000 skilled workers** in the solar sector by 2022 and lack of skilled force is one of the prominent reasons behind the noncompletion of the target.	▪ **Capacity Building and Technology and Innovation:** Expand training programs like **'Suryamitra',** and partner with educational institutions. ▪ Invest in R&D for more efficient and cost-effective solar technologies.

Drishti Mains Questions:

Q. What are the primary challenges associated with rooftop solar installation and What need to be done to address them?

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. With reference to the Indian Renewable Energy Development Agency Limited (IREDA), which of the following statements is/are correct? (2015)

1. It is a Public Limited Government Company.
2. It is a Non-Banking Financial Company.

Select the correct answer using the code given below:

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: (c)

Mains

Q. “Access to affordable, reliable, sustainable and modern energy is the sine qua non to achieve Sustainable Development Goals (SDGs)”.Comment on the progress made in India in this regard. **(2018)**