



# Roadmap of Solar Energy for Universal Energy Access

**For Prelims:** Clean Energy, Solar Energy, [International Solar Alliance](#), [National Solar Mission](#), PM-KUSUM

**For Mains:** Solar Energy and Development in India, Challenges Related to Solar Energy, Government Schemes to Enhance Solar Energy Production in India.

**Source:** [PIB](#)

## Why in News?

Recently, the **Ministry of New and Renewable Energy (MNRE)**, in partnership with the [International Solar Alliance](#), unveiled the report titled '**Roadmap of Solar Energy for Universal Energy Access**' developed under [India's G20 presidency in 2023](#). It showcased how [solar energy](#) can play a key role in achieving electricity access and providing socio-economic benefits globally.

- The roadmap is unveiled during the **4<sup>th</sup> G20 Energy Transition Working Group** held in Goa. It focuses on achieving **Universal Energy Access by 2030** and highlighted the crucial role of **solar mini grids** in driving sustainable energy solutions.

## What are the Key Highlights of the Report?

- The roadmap emphasizes solar energy as a **key solution to achieve Universal Energy Access by 2030**.
- It identifies around **59% (396 million people)** of the unelectrified population best suited for electrification through solar-based mini-grids.
- Approximately **30% of the unelectrified population (203 million people)** can be electrified through grid extensions, and the remaining **11% of the unelectrified population (77 million people)** through Decentralized Renewable Energy solutions.
- A total investment of **around USD 192 billion** is required to accomplish the electrification goals, distributed among solar-based mini-grids, solar-based decentralized renewable energy solutions, and grid extensions.
- **Viability gap funding of around 50% (USD 48.5 billion)** is needed to support mini-grid deployment.
- The roadmap underscores the importance of addressing challenges related to **policies, regulations, and financial risks** for successful and sustainable scaling up of solar energy solutions.
- It highlights the need for **technical and financial expertise, skill development, and awareness creation** in energy access-deficit regions to drive electrification initiatives.
- The report advocates for **increased investments, ecosystem development, and optimal resource utilization** to accelerate universal energy access.
- Integration of solar **PV-based cooking solutions with electrification** initiatives is emphasized as a way to enhance energy access in remote and underdeveloped areas.

## What is Solar Mini-grids?

- **About:**
  - Solar mini-grids are **small-scale electricity generation and distribution systems** that use **solar photovoltaic (PV) technology** to generate electricity and store it in batteries.
  - They are typically designed to provide electricity to **communities or areas that either need to be connected to the main power grid** or experience frequent power outages.
- **Importance:**
  - Around **9% of the global population still lacks access to electricity**, with Sub-Saharan Africa and rural areas being the most affected.
    - Solar mini-grids can play a crucial role in addressing this challenge by providing reliable and affordable electricity to these communities.
  - Moreover, **over 1.9 billion people worldwide lack access to clean cooking**, and solar mini-grids can also power electric stoves or other cooking appliances, providing clean cooking solutions.
- **Benefits of Solar Mini-grids:**
  - **Reliability:** Solar energy, with the aid of energy storage systems, offers a reliable source of electricity that remains resilient even **during natural disasters or power outages**.
  - **Sustainability:** Solar energy is a clean and renewable energy source, which helps reduce greenhouse gas emissions and mitigate climate change.
  - **Scalability:** Solar mini-grids can be scaled up or down depending on the energy demand of the community, making them a flexible option for energy access.
  - **Solar Mini-grids Affordability:**
    - Solar energy is a cost-effective alternative to diesel generators in remote regions or islands, where expensive fuel transportation can lead to electricity costs as high as **Rs. 36 per unit**.
      - Harnessing **solar power offers a sustainable and economically viable solution** to reduce electricity expenses in these areas.
    - Deployment of decentralized solar is **supported through Feed-in Tariffs and tariff** restructuring for grid-connected capacity.
    - Expected reduction in battery costs with large-scale procurement further boosts the development of solar mini-grids.

## What are the Challenges in the Deployment of Solar Energy for Universal Energy Access?

- Lack of **enabling policies and regulations** that can support the deployment of solar energy for universal energy access.
- Challenges in equipment manufacturing, on-ground execution, and maintenance need to be addressed for sustained affordability.
- Accumulation of dust on solar panels reduces their output by up to 30 percent in a month, necessitating regular cleaning.
  - Current water-based cleaning methods use about 10 billion gallons annually, but waterless methods are labor-intensive and cause scratching.
- **High financial risks in underdeveloped regions** increase project costs for developers, widening the gap between consumer affordability and supplier viability.
- Need for **more technical and financial expertise** to implement and maintain solar mini-grids.

## What is the International Solar Alliance (ISA)?

- **About:**
  - Co-founded by India and France during 2015 during the [UN Climate Change Conference](#), the **ISA** is an action-oriented, member-driven, collaborative platform for increased deployment of [solar energy](#) technologies.
  - Its basic motive is to facilitate energy access, ensure energy security, and drive energy transition in its member countries.
  - ISA is the nodal agency for implementing [One Sun One World One Grid \(OSOWOG\)](#), which seeks to transfer solar power generated in one region to feed the electricity demands of others.
- **Headquarters:**

- The Headquarters is in India with its **Interim Secretariat** being set up in Gurugram.
- **Member Nations:**
  - A total of 109 countries have signed the ISA Framework Agreement and 90 have ratified it.
  - All member states of the [United Nations](#) are eligible to join the ISA.
- **Observer Status to International Solar Alliance:**
  - The [United Nations General Assembly \(UNGA\)](#) has granted Observer Status to the International Solar Alliance (ISA).
  - It will help provide for regular and well-defined cooperation between the Alliance and the United Nations that would benefit global energy growth and development.
- **SDG 7:**
  - Sustainable Development Goal 7 (SDG7) calls for “affordable, reliable, sustainable and modern energy for all” by 2030. It’s three core targets are the foundation for our work: By 2030:

## What are the Government Schemes to Enhance Solar Energy Production in India?

- [International Solar Alliance](#)
- [National Solar Mission](#)
- [Kisan Urja Suraksha evam Utthaan Mahabhiyan \(PM-KUSUM\)](#)
- [One Sun, One World, One Grid \(OSOWOG\)](#)
- [Solar Park Scheme](#)
- [Rooftop Solar Scheme](#)

## Way Forward

- Assisting access-deficit countries in developing enabling policy and regulatory frameworks.
- Facilitating private-sector participation in energy access projects.
- Integration of solar PV-based cooking solutions with electrification initiatives.
- Incentives and subsidies to attract investments. Exploring innovative financing models like green bonds.
- Hybridization with wind or biomass energy enhances mini-grid reliability and lowers power equipment costs.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Prelims

#### Q. Consider the following statements: (2016)

1. The International Solar Alliance was launched at the United Nations Climate Change Conference in 2015.
2. The Alliance includes all the member countries of the United Nations.

#### Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (a)**

### Mains

**Q.** India has immense potential of solar energy though there are regional variations in its developments. Elaborate. **(2020)**

PDF Refernece URL: <https://www.drishtias.com/printpdf/roadmap-of-solar-energy-for-universal-energy-access>

