

ENERGY CATALYST

Country Guide: India

May 2023



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India is located in South Asia. It is the seventh-largest country by area, the second-most populous country, and the most populous democracy in the world. Bounded by the Indian Ocean on the south, the Arabian Sea on the southwest, and the Bay of Bengal on the southeast, it shares land borders with Pakistan to the west, China, Nepal, and Bhutan to the north, and Bangladesh and Myanmar to the east. India is in the vicinity of Sri Lanka and the Maldives, and the Indian islands Andaman and Nicobar share a maritime border with Thailand and Indonesia.



Figure 1 Map of India. Source: d-maps

Government

India is the world's most populous democracy and is a parliamentary republic with a multi-party system. Federalism in India defines the power distribution between the union or central government and the states. It is mainly composed of 28 states and eight Union territories. It is a member of the South Asian Association for Regional Cooperation (SAARC), the United Nations, the Commonwealth Nations, BRICS, and G20, among other global platforms.

Geography and climate

The climate of India is comprised of a wide range of weather conditions across a vast geographic scale and varied topography. The climate in south India is generally warmer than in north India. The country's meteorological department follows the international standard of four climatological seasons with some local adjustments: winter (January and February), summer (March, April, and May), monsoon season (June to September), and a post-monsoon period (October to December).

Economy

India is the world's fifth-largest economy by nominal GDP and the third largest by purchasing power parity. The country aspires to become a high-middle-income country by 2030. India's GDP growth rate in the last 10 years has been at an average growth rate of 5-6%, with a negative growth of (-) 6.6% witnessed in 2020.¹ The economy has since recovered with a growth rate of 8.7% in 2021 and 7% in 2022.² Over the last decade, India's strong economic growth has been accompanied by considerable improvements in living standards in India. Since the 2000s, India has made progress in reducing absolute poverty. Between FY 2016 and 2021, incidence of poverty is estimated to have declined from 27.7% to 16.4%.³ Between 1990 and 2021, India's HDI value increased by an average annual growth of 1.22%⁴ with an increase in the country's life expectancy at birth by 8.5 years, and mean years of schooling by 3.9 years, and expected years of schooling by 3.9 years.⁵

¹ [Database: Annual GDP Growth Rate of India](#), World Bank (accessed on 26 May 2023)

² [Summary of the Economic Survey of India 2022-23](#), Ministry of Finance, Jan 2023

³ [Global Multidimensional Poverty Index 2022](#), UNDP, Oct 2022

⁴ [Human Development Report 2021/22](#), UNDP, 2022

⁵ [Article: India slips In Human Development Index Report](#), Live Mint, Sep 2022

The energy sector in India

India is the world's third-largest producer and third-largest consumer of electricity. Factors like economic growth, increasing prosperity, a growing rate of urbanisation, and rising per capita energy consumption have contributed to the increasing demand for energy in the country. India has achieved electricity access for 99% of its population as of 2020; with coverage of 100% of the urban population and 98.5% of the rural population.¹¹ Achieving universal energy access at affordable prices and for 24 hours a day by 2022 continues to be a top priority of the government and the states. The [Saubhagya](#) and the [Deen Dayal Upadhyaya Gram Jyoti Yojana \(DDUGJY\)](#) schemes are the main government policies to ensure electricity access for villages and rural households in India.¹²

Table 1: India at a glance

Capital	New Delhi
Total Area	3.287 million km ²
Population	1.41 billion (2021) ⁶
Official languages	English; Hindi
Rural Population	65% (2021) ⁷
GDP	USD 3.18 trillion (2021) ⁸
GDP Per Capita	USD 2,256 (2021) ⁹
Currency	INR (Indian Rupee)
Exchange rate 01/04/2023	1 USD= 82.38 INR ¹⁰
Exchange rate 01/03/2018	1 USD= 65.19 INR
Access to Electricity	99% of total population (2020)

As of April 2023, the installed power generation capacity in India is 416 GW. This constitutes 237 GW of thermal power generated from coal, lignite, gas or diesel, 67.1 GW from solar power, 46.8 GW from hydropower, 42.8 GW from wind power, 10.2 GW from biopower, 6.78 GW from nuclear power and 4.94 GW from small hydropower.¹³ Renewable energy (RE) is the highest rising segment of generation capacity with a compounded annual growth rate (CAGR) of 15.6% since the last seven years.¹⁴ The Government of India has a target to install 500 GW of renewable energy capacity by 2030, which mainly includes ~293 GW from solar power, ~100 GW from wind power, ~54 GW from hydropower and ~15 GW from biomass.¹⁵ Of this, ~12 GW of solar, ~2 GW of wind, 120 MW of hydropower, 120 MW of biomass and 95 MW of small hydropower capacity has been commissioned during 2022-23.¹⁶ This will also help the country meet its commitment towards reducing its GHG emissions intensity per unit GDP by 45% below 2005 levels by 2030, as per the Intended Nationally Determined Contribution (INDC) that India has submitted to UNFCCC, which outlines its post-2022 climate action plans.¹⁷ India's Central Bank, the Reserve Bank of India, has included RE projects under priority sector lending, for which bank loans of up to INR 30 crore (USD 4 Mn) will be available for RE projects.¹⁸ In addition to this, foreign direct investment (FDI) of up to 100% is permitted in the RE sector under the automatic route and no prior government approval is required for this.¹⁹

⁶ [Database: Total Population - India](#), World Bank (accessed on 26 May 2023)

⁷ [Database: Rural Population \(% of total population\) - India](#), World Bank (accessed on 26 May 2023)

⁸ [Database: GDP \(current US\\$\) - India](#), World Bank (accessed on 26 May 2023)

⁹ [Database: GDP per capita \(current US\\$\) - India](#), World Bank (accessed on 26 May 2023)

¹⁰ [Exchange Rate Archives by Month](#), IMF (accessed on 26 May 2023)

¹¹ [Database: Access to Electricity \(% of population\)](#), World Bank (accessed on 26 May 2023)

¹² [Rural Electrification Schemes](#), Ministry of Power, Dec 2022

¹³ [Dashboard: Power Sector at Glance, Ministry of Power](#) (as of 30 April 2023)

¹⁴ [India's Long-Term Low-Carbon Development Strategy](#), MoEFCC, 2022

¹⁵ [Report on Optimal Generation Mix 2030 Version 2.0](#), Central Electricity Authority, April 2023

¹⁶ *Ibid*

¹⁷ [India's Updated First Nationally Determined Contribution Under Paris Agreement 2021-30](#), Gol, April 2022

¹⁸ [Government Efforts to Avail Easy Financing to RE Generating Companies](#), MNRE, Feb 2023

¹⁹ [Government takes several initiatives to promote and create new markets in renewable energy sector](#), MNRE, Dec 2022

Solar power

India is endowed with a solar radiation intensity of approximately 4-7 kWh per sq. m per day and average peak sun hours of “5 hours/day”. About 5,000 trillion kWh per year energy is incident over India. As of April 2023, total solar installed capacity is 67.1 GW, of which 2.4 GW pertains to solar off-grid.²⁰

India stood 5th in solar power installed capacity globally in 2022.²¹ The country's solar potential is estimated to be about 748.98 GW, assuming 3% of the wasteland area is covered by solar PV modules. Among the states, Rajasthan and Jammu and Kashmir have the highest solar potential, of 142 GWp and 111 GWp respectively.

The government has introduced various policies such as Renewable Purchase Obligation (RPO), Accelerated Depreciation (AD) and waiver of interstate transmission system (ISTS) charges and losses for the sale of solar and wind projects, to steer growth in the sector. They have launched various schemes to encourage the generation of solar power in the country, including Solar Park Scheme, Viability Gap funding (VGF) Scheme, Central Public Sector Unit (CPSU) Scheme, Rooftop Solar Programme, Production Linked Incentive, and KUSUM Scheme for solar water pumps. The details of the schemes and policies are available on [MNRE's Annual report 2021-22](#), which is also suggested in the section on "Further Reading". A few relevant schemes are explained in the sub-sections below.

Solar parks: The 'Development of Solar Parks and Ultra Mega Solar Power Projects' scheme by the Ministry of New and Renewable Energy (MNRE) aims to develop solar parks/mega projects with an installed capacity of 40 GW of solar power by 2023-24.²² By 2022, a total of 57 solar parks with an aggregate capacity of ~39 GW had been sanctioned, however only 10 GW solar power projects had been commissioned in these parks.²³ There has been slow progress on this scheme mainly due to challenges related to land acquisition, time lag between setting solar projects and evacuation infrastructure, environmental issues in few states, and halt in implementation due to the COVID19 pandemic. Some of the larger solar parks in India include Bhadla (2,245 MW) in Rajasthan, developed by multiple entities including a JV between Government of Rajasthan (GoR) and [IL&FS Energy Development Company](#), a JV between GoR and [Adani Renewable Energy Park](#), and [Rajasthan Solar Park Development Company Limited \(RSPDCL\)](#); and Pavagada (2,050 MW) in Karnataka developed by the [Karnataka Solar Power Development Corporation Ltd. \(KSPDCL\)](#), a JV between [Karnataka Renewable Energy Development Ltd. \(KREDL\)](#) and the [Solar Energy Corporation of India \(SECI\)](#). Some of the large players in the utility-scale solar segment include [Azure Power](#), [Adani Solar](#), [Softbank Energy](#), [Acme Solar](#), [Greenko Energy holdings](#), [NTPC](#) etc.

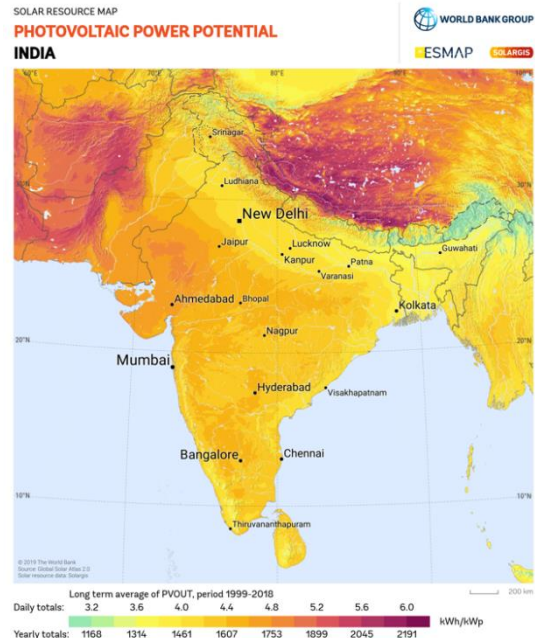


Figure 3: Global solar atlas - India (The World Bank, 2019)

²⁰ [State-wise Installed Capacity of RE Power](#), MNRE, April 2023

²¹ [Dashboard: Country Rankings as per RE capacity](#), IRENA (accessed on 26 May 2023)

²² [Grid Connected Solar Schemes](#), MNRE (accessed on 26 May 2023)

²³ [Status of Solar and Ultra Mega Solar Power Projects](#), MNRE, Dec 2022

Solar rooftop: Under the grid-connected solar rooftop programme, the ministry plans to launch 40 GW Rooftop Solar (RTS) Projects by 2026. To achieve this target, the MNRE has considered 2-25% of the overall rooftop space in India to be utilized (to set up capacities of around 1–100 kW) across various buildings, such as offices, shops, hospital, and government buildings.²⁴ MNRE has also launched the [National Portal for Rooftop Solar](#) in India to simplify the procedure for installing grid connected rooftop solar power systems for residential consumers. As of December 2022, the total installed capacity in the solar rooftop segment stood at about 11.6 GW, of which 53% was industrial, 24% commercial and 22% residential.²⁵ The states with highest installed capacity were Gujarat (2,844 MW), Maharashtra (1,474 MW), Rajasthan (896 MW), Tamil Nadu (763 MW) and Karnataka (688 MW), accounting for around 57% of the total installed rooftop solar capacity²⁶. Some of the prominent solar rooftop players in India include [Amplus Solar](#), [Tata Power Solar](#), [Fourth Partner Energy](#), [AMP Solar](#) etc. Organisations such as ADB, World Bank, USAID, GIZ and EU have also provided multilateral grants for India's solar rooftop programme.

Off-grid solar: As a part of the PM-KUSUM Scheme, the MNRE provides financial assistance for deployment of 2 million stand-alone solar agriculture pumps in India by 2026.²⁷ As of April 2023, around 0.2 million stand-alone pumps have been installed under Component B of this scheme.²⁸ Key challenges such as lack of availability of low-cost financing for farmers and limited funding by the state have affected scale-up of the scheme. The states with the maximum number of off-grid solar agriculture pumps are Rajasthan, Maharashtra, Haryana and Uttar Pradesh. The Global Off-Grid Lighting Association (GOGLA) reported a declining trend in the traditional off-grid solar product (such as solar lanterns and plug-and-play kits) market in India.²⁹ However, despite the decrease in sales, India remains the largest market for solar energy kits in South Asia with a sales volume of 432,200 units between July to December 2022. Some of the prominent private sector companies in the off-grid solar sector in India include [Simpa Energy India Private Limited](#), [Greenlight planet](#), [d.light](#), [Cygni Energy Private Ltd.](#) and last mile distributors like [Frontier markets](#) and [Dharma Life](#).

Solar tariff is determined through a competitive bidding process involving reverse e-auction. In 2022, the lowest tariff discovered was USD 0.028/kWh which is comparable to grid electricity tariffs.³⁰ Despite reducing tariffs, the solar sector faces various challenges. Large utility-scale solar projects grapple with risks such as the adverse impact of basic custom duty at 40% onwards on the import of solar panels from China and Malaysia, delayed payment by DISCOMs, delays in signing, renegotiations, and cancellation of Purchase Power Agreements (PPAs), and a mismatch in the commissioning times of the RE projects and the transmission infrastructure due to inadequate planning. Rooftop solar, on the other hand, is characterised by challenges such as delay in approval and installation of net/gross meters by DISCOMs, limited incentives for commercial and industrial (C&I) rooftop solar consumers, and stringent collateral requirements by a few financial service providers. The National Portal for Rooftop Solar, as of December 2022, had more than 79,000 registrations by residential consumers and 31,000 applications for rooftop solar installations; however, DISCOMs have given technical feasibility approval to only 6,500 (21%), with a few applications pending for more than 2-3 months. This delay is contrary to the Electricity (Right of Consumers) Rules, 2020, which state that technical feasibility is to be provided within 20 days.³¹ A few financial service providers have strict collateral requirements that consumers are unable to meet³². For instance, collateral requirements for residential rooftop solar consumers entails hypothecation of assets created out of mortgage of house as collateral for rooftop solar installation. Similarly, for MSMEs and mid and large corporates collateral requirements include property on which the rooftop plant is to be erected in addition to the asset purchased.³³

²⁴ [Operational Guidelines for Implementation of the Phase-II Grid Connected Rooftop Solar Programme](#), MNRE, 2019

²⁵ [India Solar Rooftop Map - Dec 2022](#), Bridge to India, March 2023

²⁶ [Bridge to India - Solar Rooftop Map](#)

²⁷ [Implementation of the PM-KUSUM scheme](#), MNRE, Dec 2022

²⁸ [Dashboard: PM KUSUM Scheme \(as of 30 April 2023\)](#)

²⁹ [Global Off-Grid Solar Market Semi-Annual Sales and Impact Data: July-Dec 2022](#), GOGLA, 2022

³⁰ [Lowest Solar Tariffs in India](#), Mercom, Dec 2022

³¹ [Installation of Rooftop Solar: Compliance of Electricity Rules](#), MNRE, Dec 2022

³² [Identifying Barriers for Rooftop Solar Uptake in MSMEs and Development of a Mitigating Financial Framework](#), SUPRABHA, Jan 2020

³³ [Solar Rooftop – Financial Options](#)

For the off-grid sector, servicing consumers in grid-connected areas with unreliable power supply and uncertain demand patterns are a challenge, coupled with the high distribution and transaction costs of providing services in remote rural areas.

Small hydropower (SHP)

In India, the MNRE is responsible for developing small hydropower projects with a capacity of less than 25 MW. The estimated potential of small/mini/micro hydro projects in the country is ~21 GW from 7,133 sites located in different states of India³⁴. The states of Arunachal Pradesh, Himachal Pradesh, Karnataka, Uttarakhand, and UT of Jammu and Kashmir constitute over half of this potential. The current installed capacity is highest in the state of Karnataka with 1,280 MW followed by Himachal Pradesh with 936 MW SHP projects.³⁵ As of April 2023, India had 4.94 GW of installed capacity of small hydropower, against a national target of 5 GW to be achieved by 2022. A detailed list of potential sites, installed projects, key developers, and ongoing projects in the SHP sector is provided in MNRE's [Annual Report 2021-22](#), also referenced in the section on "Further Reading". At present, there is no specific scheme by the MNRE to support to provide financial assistance for small hydropower projects.³⁶

A few public sector organisations actively working towards developing SHP projects in their respective states include [Uttarakhand Jal Vidyut Nigam Limited](#), [Sardar Sarovar Narmada Nigam Ltd.](#) and the [Ladakh Renewable Energy Development Agency](#).

Lack of hydrological data, remoteness from the grid or the nearest transmission point, and very sparse population in remote areas, are a few factors that inhibit the development of SHP projects in India.

Bio power

The current installed bio-mass power capacity (10.2 GW) is less than half of the estimated potential available in India. The potential for power generation from agricultural and agro-industrial residues is estimated at about 28.5 GW based on 228 MMT of surplus biomass which is generated annually. There is a potential of surplus power generation through bagasse cogeneration in sugar mills that is estimated at around 13.9 GW.³⁷ Thus, the total estimated potential for biomass power is about 42.3 GW. The leading states for biomass power, bagasse cogeneration and non-bagasse cogeneration plants are Uttar Pradesh and Maharashtra, accounting for nearly 45% of the installed capacity. This is followed by Karnataka and Tamil Nadu.³⁸ India also presents a significant potential for setting up biogas plants, considering it has a livestock population of 512.06 million.

In this regard, the government offers the following central sector schemes under off-grid/ distributed and decentralised renewable power:

- a. Biogas Programme by the MNRE, delivers financial assistance for small biogas plants ranging from 1 m³ to 25 m³ per day and medium biogas plants of generation above 25 m³ per day, with a target of setting 22,500 plants in 2022-23³⁹
- b. GOBARDHAN scheme by the Ministry of Drinking Water and Sanitation, provides financial assistance for setting up of community biogas plants in villages at the sub-national level

³⁴ [Annual Report 2020-21](#), MNRE, 2022

³⁵ [Database: Small Hydro Energy](#), MNRE (accessed on 29 May 2023)

³⁶ [Small Hydropower Project Policies/Schemes](#), MNRE, Nov 2022

³⁷ [Annual Report 2020-21](#), MNRE, 2022

³⁸ [Installed Capacity of Biomass Power, Bagasse Cogeneration and Non-Bagasse Cogeneration Plants in India](#), MNRE, March 2023

³⁹ [Biogas Programme Guidelines](#), MNRE, Nov 2022

A few organisations working in the biomass sector in India are [Husk Power Systems](#), [Avani Bio Energy](#) and [Decentralised Energy Systems \(India\) Pvt. Ltd.](#), among others.

Some of the key challenges encountered by enterprises operating in the biomass market in India include the high cost of storing and transporting biomass; ensuring a regular supply of biomass at reasonable rates, especially in light of various competing uses of biomass resources; and operating in a largely informal and unorganised biomass market represented by small and marginal farmers, and fragmented landholdings.

Wind power

India is ranked 4th in the world in wind power generation after China, the US and Germany, with a total installed capacity of 42.8 GW as of April 2023. The estimated potential of wind energy in India is about 302.25 GW and 695.50 GW at 100 mts and 120 mts respectively, with the most promising potential in the states of Gujarat, Maharashtra, Rajasthan, Karnataka, Tamil Nadu, Andhra Pradesh, and Madhya Pradesh.⁴⁰

The Government of India is promoting wind power projects through private sector investments by providing various fiscal and financial incentives such as Accelerated Depreciation benefits, generation-based incentives and concessional custom duty exemption on certain components of wind electric generators. In addition to the fiscal incentives, the following support mechanisms have been put in place to promote wind power on a large scale:

- a. Technical support, including wind resource assessment and identification of potential sites through the National Institute of Wind Energy, Chennai
- b. Waiving off inter-state transmission charges and losses for wind and solar projects up to 2025

India has a long coastline of about 7,600 km, it is surrounded by water on three sides, and has a high potential for harnessing offshore wind energy. In this regard, “National offshore wind energy policy” has been notified by the Government of India for the development of offshore wind energy in the Indian exclusive economic zone (EEZ). The MNRE plans to set up offshore wind projects of cumulative capacity of 10 GW by 2030, mainly in the two states of Tamil Nadu and Gujarat.⁴¹ To incentivize bidders, the government plans on providing free of cost evacuation and transmission of energy from offshore substations to onshore transmission systems.

Some of the largest onshore wind farms in India are Muppandal Windfarm in Kanyakumari, Tamil Nadu (1,500 MW) developed by the [Tamil Nadu Energy Development Agency](#), and the Jaisalmer wind park in Rajasthan (1,064 MW) developed by [Suzlon Energy](#). The prominent players in the sector are [Renew Power](#), [Greenko Energy Holdings](#), [Tata Power](#) and [Mytrah Energy](#).

The main impediments to the growth of the wind sector in India include difficulty in procuring land promptly for onshore plants, the poor financial health of discoms leading to delays of 12-24 months in payments to independent power producers (IPP), lack of an effective mechanism for regional cooperation that would enable the power exchange between power surplus and power deficit regions, and sluggish expansion of transmission lines. Some of the specific challenges regarding offshore wind energy are lack of well-defined regulatory structure, delays in granting statutory clearances, low tariff regime and environmental considerations.

⁴⁰ [Annual Report 2020-2021](#), MNRE, 2022

⁴¹ [Offshore Wind Energy in India](#), MoP, June 2022

RE mini grids

As of March 31, 2021, around 216 MW capacity of stand-alone power plants (off-grid power plants) had been set up in the country.⁴² 4 GW is the estimated potential for mini grids across rural areas of the country, that are facing challenges due to unreliable supply of electricity despite grid expansion. There aren't any significant policies at the central level for promotion of mini grids, however a few states (like Uttar Pradesh, Bihar, Odisha and Jharkhand) have drafted guidelines/policies for deployment of mini grids. At the central level, the Ministry of Power's Tariff Policy of 2016 allows DISCOMs to purchase mini-grid electricity and provides relevant guidelines, although only a few states have adopted these guidelines. The Central Electricity Authority (CEA), through its Technical Standards for Connectivity of Distributed Generation Resources Regulations, 2013, allows distributed energy sources to be connected to the central grid in all states.

One of the more active players in the Indian mini grid market is [Smart Power India](#), a subsidiary of the Rockefeller Foundation, which has supported development of 606 renewable energy mini grids of 18.3 MW capacity mainly across the states of Uttar Pradesh, Bihar, and Jharkhand as of March 2023. It aims to facilitate deployment of more than 4,000 RE mini grids by 2025.⁴³ [The Minda Foundation](#) has also installed over 310 micro and pico grids in the States of West Bengal and Jharkhand, of up to 8 KWp. In November 2019, the Rockefeller Foundation founded TP Renewable Microgrid with [Tata Power](#) to build 10,000 micro/mini-grids (capacity 10 kW – 70 kW) across India by 2026. Some of the other key mini-grid developers in the market include [OMC Power](#), [ONergy Solar](#), [Gram Oorja](#) and Husk Power.

The mini grid sector in India faces an existential threat in light of the intensification of grid supply in the country. It is therefore important for developers to select states which have guidelines to interconnect mini grids to the main grid. Other risks include delays in land acquisition for the projects, shortage of skilled labour in rural areas, high tariffs, load intermittency and limited demand leading to sub-optimal plan utilisation and risk of electricity theft.

⁴² [Mini Grids: A Just and Clean Energy Transition for India](#), CSE, 2022

⁴³ [Smart Power India: Mini Grid Model](#), Smart Power India (accessed on 29 May 2023)

Key government institutions

Institution	Role
Ministry of New and Renewable Energy (MNRE)	The institution formulates policies to facilitate research, design, development, manufacture, and deployment of new and renewable energy systems, applicable in transportation, portable and stationary applications in rural, urban, industrial, and commercial sectors. Website: https://mnre.gov.in/
Ministry of Power (MoP)	The institution deals with planning, policy formulation, administration and enactment of legislation related to thermal and hydropower generation, transmission, and distribution. It also monitors the implementation of projects along with their investment decisions. Website: https://powermin.nic.in/
Central Electricity Authority (CEA)	CEA advises the government and commissions on technical matters relating to generation, transmission, and distribution of electricity. It also sets technical standards for setting up electricity plants, electricity lines and connectivity to grids. Website: http://cea.nic.in/
Regulatory bodies	Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commission (SERC) set the tariff and provide licenses to the power generating companies, power transmission companies and power distribution companies. They also regulate the Renewable Purchase Obligations (RPO) to be carried out by power generation and distribution companies and also issue RE certificates (REC). Website: http://www.cercind.gov.in/
Indian Renewable Energy Development Agency Limited (IREDA)	IREDA is a Public Limited Government Company established as a Non-Banking Financial Institution. It is engaged in promoting, developing, and extending financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. Website: https://www.ireda.in/
Solar Energy Corporation of India Ltd (SECI)	Solar Energy Corporation of India Ltd. is a Central Public Sector Undertaking under the MNRE and facilitates the implementation of the National Solar Mission and achievement of targets set therein. Website: https://seci.co.in/
National Institution for Transforming India, NITI Aayog	It is a policy think tank of the Government of India that designs strategic and long-term policies and programmes for the government and provides technical advice to the Centre and States. Website: https://niti.gov.in/
Ministry of Environment Forest and Climate Change (MoEFCC)	MoEFCC is India's nodal agency for planning, coordination, promotion, and overseeing the implementation of India's environmental and forestry policies and programmes. Website: http://moef.gov.in/

Institution	Role
Department of Economic Affairs (DEA)	<p>The DEA, within the Ministry of Finance, is responsible for advising the Ministry on economic issues have a bearing on various aspects including inflation, price control, foreign exchange management, Official Development Assistance in domestic finance and preparation of the Union Budget, and bilateral development assistance from all G8 countries, in the form of grants, loans, and other concessional finance into the relevant sectors.</p> <p>Website: https://dea.gov.in/</p>
Power system Operation Corporation Ltd. (POSOCO)	<p>It administers the load despatch centres (Regional load despatch centres and State load despatch centres) and implements the framework on forecasting, scheduling and imbalance handling of renewable energy generating stations.</p> <p>Website: https://posoco.in/</p>
Indian Energy Exchange (IEX)	<p>It manages the platform for power trading exchanges including Renewable Energy Certificates (REC) regulated by CERC.</p> <p>Website: https://www.iexindia.com/</p>
National Institute of Solar Energy (NISE)	<p>It is an autonomous institution under MNRE that assists the Ministry in implementing the National Solar Mission and coordinates research, technology, and other related works in the sphere of solar energy.</p> <p>Website: https://nise.res.in/</p>
National Institute of Wind Energy (NIWE)	<p>It is an autonomous institution under MNRE which coordinates research, technology and other related works in wind power within the energy sector.</p> <p>Website: https://niwe.res.in/</p>

Industry associations

Industry Association	Features
Federation of Indian Chambers of Commerce and Industry (FICCI)	<p>It is a non-governmental, not for profit organisation that provides a platform for networking and consensus building within and across sectors by connecting Indian industry, policy makers and the international business committee.</p> <p>Website: http://ficci.in/</p>
Associated Chambers of Commerce and Industry of India (ASSOCHAM)	<p>The organisation represents the interests of trade and commerce in India, and acts as an interface between issues and initiatives. Its goal is to promote both domestic and international trade, and to reduce trade barriers while fostering a conducive environment for the growth of trade and industry of India.</p> <p>Website: https://www.assochem.org/</p>
Indian Wind Power Association (IWPA)	<p>This is a not-for-profit organization which represents stakeholders of the wind energy sector in India. The key objective is to address policy and market barriers to wind power development and create an enabling regulatory and policy environment for investments in this sector.</p> <p>Website: https://windpro.org/</p>
Indian Biogas Association (IBA)	<p>It is an association for operators, manufacturers and planners of biogas plants, and representatives from public policy, science, and research in India. The mission of IBA is to increase awareness of biogas, promote research and development activities in the sector, and enable policy development and to set up 5,000 new commercial biogas plants by the end of the year 2024.</p> <p>Website: https://biogas-india.com/</p>
Clean Energy Access Network (CLEAN)	<p>CLEAN is a pan India organisation that supports the growth of the decentralised clean energy sector in India, by bringing together diverse stakeholders working towards improving energy access for the rural and urban poor.</p> <p>Website: https://www.thecleannetwork.org/</p>

References and further reading

MNRE Annual Report 2021-2022

https://mnre.gov.in/img/documents/uploads/file_f-1671012052530.pdf

MNRE Portal for Renewable Energy

<https://mnre.gov.in/>

National Power Portal

<https://npp.gov.in/publishedReports>

Central Electricity Authority Monthly Reports

<http://cea.nic.in/monthlyexesummary.html>

India 2021, Energy Policy Review, IEA

<https://www.iea.org/reports/india-energy-outlook-2021>

Mini-grid handbook, a business guide for developers and investors, November 2019

https://smartpowerindia.org/Media/1140/MGH%20Hand%20Book_V3%202022%20Nov%20Final%20Edited%20or%20web%20use%201.pdf

Make in India programme

<https://www.makeinindia.com/sector/renewable-energy>

Mini-Grid India: Scoping Study (CSE, 2022)

<https://www.cseindia.org/mini-grids-a-just-and-clean-energy-transition-11276>

India's Nationally Determined Contribution

<https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf>

Village and household electrification status in India

<https://saubhagya.gov.in/>

Official UK Government travel advice for India

<https://www.gov.uk/foreign-travel-advice/india>

Useful contacts

Ministry of New and Renewable Energy (MNRE)

New and Renewable Energy, Block 14, Ministry of,
Lodhi Rd, CGO Complex, New Delhi,
Delhi 110003

Ministry of Power

Joint Secretary, Ministry of Power
Room No. 415, 4th Floor
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British High Commission New Delhi

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FICCI (Federation of Indian Chambers of Commerce and Industry)

Federation House. Tansen Marg,
New Delhi 110001

ASSOCHAM

5, Sardar Patel Marg,
Diplomatic Enclave, Chanakyapuri,
New Delhi, Delhi 110021

Please contact your Client Relationship Manager if you want help with introductions to specific individuals with these institutions.