Solar Power

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A Practical Handbook - Consulting Editors Matthew Williams and John Deaco

PHOENIX LEGAL

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India

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1. Introduction

Earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed. (Mahatma Gandhi)

The effects of global warming and ever-rising pollution have brought an increased environmental consciousness among people globally. Various attempts have been made by governmental and non-governmental bodies to spread awareness about climate change and to control pollution. In India, use of fossil fuel-based energy resources, including in power generation, is one of the major reasons for pollution. On 2 October 2016, India ratified the Paris climate accord[1] and committed to reduce its emission intensity to 35% below 2005 levels by 2030 and achieve a 40% cumulative electricity power capacity from non-fossil fuel-based energy resources by 2030.[2] This shows India's twin focus on using renewable energy to meet its power requirements while simultaneously addressing the problem of pollution.

Among the various renewable energy resources such as solar, wind, small hydro and biomass, India, being a tropical country, has a high potential for solar energy. Most parts of India witness 300 sunny days a year,[3] which translates into an incidence of 5,000 trillion kWh per year of energy over India's land mass (with most parts receiving 4–7 kWh per sq m each day).[4] India can capitalise on this huge potential by using the latest advanced solar PV[5] and thermal technologies[6] and fulfil its commitment under the Paris climate accord.

This chapter sets out a general overview of key developments of the solar power sector in India and the Indian regulatory aspects applicable to the said sector.

2. Brief history of the solar power sector in India

2.1 Solar power sector in general

Less than a decade ago, solar projects were struggling to gain popularity and were

1 See http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
2 India's Intended Nationally Determined Contribution, see www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf.
3 The Ministry of New and Renewable Energy's Annual Report for year 2016–17, see http://mnre.gov.in/file-manager/annual-report/2016-2017/EN/index.html.
4 The Jawaharlal Nehru National Solar Mission, see www.mnre.gov.in/file-manager/UserFiles/mission_document_JNNSM.pdf.
5 Solar photovoltaic technology enables direct conversion of sunlight into energy.
6 Solar thermal technology utilises heat content of solar energy into useful application.

required to be heavily subsidised by the Indian central government. The government's focus was on coal-fired power generation to support the unprecedented economic growth being witnessed during that period. Indeed, the Indian government had planned to set up ultra-mega power projects, each having a capacity of about 4,000 MW.[7]

In contrast to this earlier emphasis, the Gujarat state government recently dropped a plan to build a 4,000 MW imported coal-based ultra-mega power project because it believes that upcoming renewable energy units could meet its power requirements.[8] This may be explained partly by the historic low tariffs offered by private bidders in the recently concluded competitive reverse auction for solar power projects in India which, surprisingly, were lower than conventional (coal-based) sources.[9] The government received a low tariff of Rs 2.44/kWh (ie, US$ 0.037/kWh) for 500 MW of capacity in one of India's largest solar parks.[10] To put this into perspective, in 2010 the tariff hovered around Rs 12.16/kWh (ie, US$ 0.17/kWh).[11] This change augurs well for the prospects of solar power plants in India.

2.2 Solar power sector – development of laws/schemes/plans

(a) National Action Plan on Climate Change

India has been a keen and active participant in multilateral negotiations dealing with global challenges posed by climate change including the United Nations Framework Convention on Climate Change. However, its commitment to a cleaner environment has been practically difficult to implement because of the imperatives of growth and the need to meet the energy requirements of its vast population. As part of its commitment to a cleaner environment, and on the premise that developed nations will provide technologies and adequate financial resources, on 30 June 2008 India announced its plan for climate change, the National Action Plan on Climate Change (NAPCC).[12]

The NAPCC, without compromising India's prospects for a high growth rate (which is essential for increasing the standard of living of Indian people and reducing vulnerability to climate change), provides Eight National Missions that form its core.

(b) Jawaharlal Nehru National Solar Mission

The central government launched its flagship programme as one of the Eight National Missions identified in the NAPCC with the name 'Jawaharlal Nehru National Solar Mission' (JNSM). Under the brand 'Solar India', JNSM set an ambitious target of deploying 20,000 MW of grid-connected solar power in India by 2022.[13]

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7 See www.pfcindia.com/Home/VS/22.

8 See www.financialexpress.com/industry/yogi-adityanath-cancels-bids-for-3800-mw-power-in-uttar-pradesh/663124/lite/.

9 See www.qz.com/984656/solar-power-is-now-cheaper-than-coal-based-electricity-in-india-but-the-math-makes-no-sense/.

10 *Id.*

11 See www.cleantechnica.com/2017/04/17/solar-bid-prices-india-fallen-73-since-2010/ and www.thehindu businessline.com/news/solar-tariffs-have-declined-by-73-per-cent-in-india-since-2010-mercom/article9599908.ece.

12 See www.moef.nic.in/sites/default/files/Pg01-52_2.pdf.

Achievement of this target was envisioned in three phases (the first phase up to 2013, the second phase from 2013–17 and the third phase from 2017–22).[14]

However, in June 2015, the central government approved a revision of cumulative targets under JNSM from 20,000 MW (20 GW) by 2021–22 to 100,000 MW (100 GW) by 2021–22 for grid-connected solar power projects.[15] The revised target of 100,000 MW is planned to be achieved in a seven-year period. Broadly, it consists of 40,000 MW (40 GW) of grid-connected rooftop projects and 60,000 MW (60 GW) of large and medium-sized land-based solar power projects.[16] JNSM is a policy of the central government pursuant to which several other schemes and incentives have been provided. It is discussed in further detail under section 3 of this chapter.

(c) International Solar Alliance

The International Solar Alliance (ISA) was inaugurated on 30 November 2015 at the climate summit in Paris. It has been set up with the United Nations as a strategic partner and India has been chosen for its headquarters. The foundation stone for the headquarters in India was laid on 25 January 2016 jointly by the Indian Prime Minister and the French President at the National Institute of Solar Energy in Gurugram, State of Haryana. ISA creates a collaborative platform for increased deployment of solar energy technologies to enhance energy security and sustainable development. Some commentators believe[17] that the ISA needs a stronger focus and more commitment from the developed world.

(d) Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya Scheme)

The central government launched the Saubhagya Scheme on 25 September 2017 to achieve universal household electrification by 31 December 2018 by providing last mile connectivity to all households in rural and urban areas in India.[18] Households in remote and inaccessible areas will be offered decentralised solar PV-based systems of 200–300 Watt peak each with battery packs, 5 LED lights, a fan and a power plug, along with free maintenance for five years.[19] Earlier, the Deendayal Upadhyaya Gram Jyoti Yojana (DUGJ Scheme) was launched in 2015 with the aim of electrifying all 18,000 unelectrified villages by May 2018. Further, the '24×7 Power for All' programme was launched in 2015 with the objective of providing 24×7 power to all consumers across India by 2019.[20] Though the central government has claimed successful implementation of the DUGJ Scheme, several reports have contradicted this claim.[21] Some commentators have attributed this to the definition of electrified

13 See footnote 3 above.
14 *Id.*
15 See footnote 2 above.
16 *Id.*
17 See www.bridgetoindia.com/international-solar-alliance-needs-stronger-focus-and-more-commitment-from-the-developed-world/.
18 See http://pib.nic.in/newsite/PrintRelease.aspx?relid=171103; and http://pib.nic.in/newsite/PrintRelease.aspx?relid=171101.
19 See www.powermin.nic.in/sites/default/files/webform/notices/OM_SAUBHAGYA_SIGNED_COPY.pdf.
20 See www.pib.nic.in/newsite/PrintRelease.aspx?relid=156256.
21 See www.thehindu.com/opinion/op-ed/On-paper-electrified-villages-%E2%80%94-in-reality-darkness/article14176223.ece; and www.dnaindia.com/india/report-modi-government-s-flagship-scheme-deendayal-upadhyay-gram-jyoti-yojna-remains-largely-on-paper-2236194.

village adopted by the central government, as a village is considered electrified by the government if public places in the village and 10% of its households have access to electricity.

3. Overview of market participants

3.1 Solar power developers/generators

Amendment of the Electricity (Supply) Act 1948 (which came into force on 15 October 1991) permitted the establishment of electricity projects by private sector generating companies and sale by them to the then Electricity Boards, resulting in a phenomenal growth in private sector power projects in India. Also, the Electricity Act 2003 (Electricity Act) has delicensed electricity generation (including captive generation of electricity).[22] As of 31 March 2017, of the total commissioned capacity, 47% is owned by Indian corporates, 18% by international developers, 10% by public sector undertakings (which are in effect entities owned by central and state governments) and 25% by independent power producers (backed by PE funds).[23]

3.2 Manufacture/import of solar modules

Solar module manufacturing in India has seen a downturn over recent years due to technological obsolescence and sub-scale manufacturing volumes. India's requirements are largely met by imports from other countries, particularly the United States and China. Even though the central government came up with various incentives to give a fillip to domestic manufacturing of solar modules, including imposing domestic content requirement (DCR) norms, operating cost and capital subsidy under different policies, these have failed to achieve the desired objective.[24]

3.3 Transmission

Transmission[25] of power between (Indian) states is carried out by the Power Grid Corporation of India Limited (an Indian state-owned electric utility). The intra-state transmission system is managed by the respective state transmission utilities. These transmission utilities manage the network of transmission lines to aid the distribution licensees[26] in operating a distribution system for supplying electricity to consumers in their area of supply. These power lines are operated in accordance with the standards prescribed by the authorities/regulators set up under the Electricity Act.

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22 Section 7 of the Electricity Act. Section 2(28) of the Electricity Act defines 'generating company' as any person which owns or operates or maintains a generating station.

23 See p13 of India Solar Handbook 2017, Bridge to India, see www.bridgetoindia.com/wp-content/uploads/2017/05/BRIDGE-TO-INDIA_India-Solar-Handbook_2017-1.pdf.

24 *Id*, p.20.

25 Section 2(72) of the Electricity Act defines 'transmission lines' to mean all high pressure cables and overhead lines (not being an essential part of the distribution system of a licensee) transmitting electricity from a generating station to another generating station or a sub-station, together with any step-up and step-down transformers, switch-gear and other works necessary to and used for the control of such cables or overhead lines, and such buildings or part thereof as may be required to accommodate such transformers, switch-gear and other works.

26 Section 2(17) of the Electricity Act defines distribution licensee to mean a licensee authorised to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply.

3.4 Distribution companies (DISCOMs)

DISCOMs form the distribution system[27] and are licensees which manage the system of wires between the transmission lines/generating stations and end consumers. Although few privately owned distribution companies exist, the overall financial position of this segment has not been great with many DISCOMs making losses and being debt-ridden. Therefore, the central government along with respective state governments have provided financial restructuring schemes including the Ujjwal DISCOM Assurance Yojana (UDAY) scheme to address problems faced by DISCOMs, including a reduction of their losses and improvement in overall operations.

4. Legislative and regulatory framework

4.1 Constitution of India

The Constitution of India provides for a quasi-federal structure of governance. Electricity is a subject matter on which both the central government and the respective state government can make laws.[28] However, in case of conflict between laws made by the central government and the state government, unless the President of India has provided consent to the state law, law made by the central government prevails. The Ministry of Power in the central government is responsible for the power sector (except for new and renewable energy) and for the issues relating to energy policy and coordination thereof and for administration of the Electricity Act.[29] The Ministry of New and Renewable Energy (MNRE) in the central government is responsible for new and renewable energy in India, which includes solar power.[30]

4.2 Electricity Act

The Electricity Act has constituted the Central Electricity Authority. The Central Electricity Authority, among others, advises the central government on matters relating to national electricity policy, specifies technical standards for construction of electrical plants, power lines and connections to the grid, safety requirements for construction, operation and maintenance of electrical plants and grid standards for operation and maintenance of transmission lines. The Electricity Act also provides for establishment of regulatory commissions at the central level (ie, the Central Electricity Regulatory Commission (CERC)) and at the state level (ie, the State Electricity Regulatory Commission (SERC)) in each Indian state. These commissions administer and regulate the generation, distribution and transmission of electricity. The CERC is required to adjudicate disputes[31] involving generating companies or transmission licensees, while the SERCs adjudicate[32] disputes between the licensees and generating companies in their respective states. Any appeal from the decisions

27 Section 2(19) of the Electricity Act defines 'distribution system' to mean the system of wires and associated facilities between the delivery points on the transmission lines or the generating station connection and the point of connection to the installation of the consumers.
28 Entry 37, List III, VII Schedule, The Constitution of India.
29 The Government of India (Allocation of Business) Rules, 1961.
30 *Id.*
31 Section 79(f) of the Electricity Act.
32 Section 86(f) of the Electricity Act.

of these commissions lies with the Appellate Tribunal for Electricity (APTEL). Appeals from the APTEL lie with the Supreme Court of India, the highest court in India.

The Electricity Act, among others, governs generation, transmission, distribution, trading and use of electricity across India.[33] The Electricity Act's object includes promotion of efficient and environmentally benign policies.[34] The Electricity Act empowers both the central and state governments to issue policy directions in the public interest. The Ministry of Power, the MNRE and the regulators (the CERC and the SERCs) have been instrumental in implementing the government's policies through statutory policies, schemes, regulations and orders.

4.3 JNSM, its schemes and targets

(a) Administration of JNSM

The Solar Energy Corporation of India Limited (SECI), a Government of India undertaking under the administrative control of the MNRE, helps in implementing JNSM and schemes such as viability gap funding (VGF). The VGF scheme provides gap-in-funding support to infrastructure projects that are economically justified but fall marginally short of financial viability.[35] The Indian Renewable Energy Development Agency Limited, another Government of India undertaking under the administrative control of the MNRE, 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.

(b) JNSM: Phase I Batch I and Batch II

In order to facilitate grid-connected solar power generation, a mechanism of 'bundling' relatively expensive solar power with power from the unallocated quota generated at NTPC coal-fired stations, which is relatively cheaper, was proposed. NTPC's Vidyut Vyapar Nigam Ltd (NVVN) was designated as the nodal agency for procuring the solar power by entering into a Power Purchase Agreement or PPA. The total aggregated capacity of the grid-connected solar projects to be developed under Phase I was 1,000 MW. The projects are to be selected for deployment of both solar PV technology projects and solar thermal technology projects in a ratio of 50:50 in MW terms. Allotment of projects was based on a bidding process and the developer offering the maximum discount in tariff was short-listed to execute the PPA with NTPC. Most of the projects set up in the first phase were based on solar PV technology.[36]

(c) JNSM: Phase II

Currently, Phase II of the JNSM is being implemented. Phase I of JNSM (2010–13)

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33 The Electricity Act, however, does not apply in the state of Jammu and Kashmir. See Section 1 of the Electricity Act.
34 Preamble to the Electricity Act.
35 See www.pppinindia.gov.in/faqs?inheritRedirect=true.
36 Guidelines for Selection of New Grid Connected Solar Power Projects, Batch II, Phase-I, see www.mnre.gov.in/file-manager/UserFiles/jnnsm_gridconnected_24082011.pdf.

generated huge interest in the solar power sector pursuant to which both grid-connected and off-grid projects were commissioned across the country.[37] Though the target set by Phase I was achieved, the central government has subsequently increased the cumulative installation target under JNSM from 20,000 MW to 100,000 MW.[38]

Phase II Batch I: Phase I was largely based on the bundling scheme described in section 4.3 (b) above. In Phase II Batch I of JNSM, the option of VGF has been selected. The total capacity of grid-connected solar projects to be set up on the build-own-operate model under this phase was 750 MW. SECI was designated as the nodal agency by the MNRE for implementation of the scheme with VGF support from the National Clean Energy Fund, in close association with the NVVN. SECI invited bids in two separate categories – Open Category and DCR Category, to promote local manufacturing of solar modules and equipment. The upper limit of VGF was fixed at 30% of the project cost or Rs 25 million per MW, whichever is lower. Phase II batch I has been successfully implemented by SECI with a total capacity of 750 MW.[39]

Phase II Batch II: The MNRE provided for a state-specific bundling scheme to add 3,000 MW of solar power projects to be implemented by NVVN in solar parks, to be developed through the association of central or state agencies with land provided by state governments or by private solar power developers in the respective states. MNRE facilitated the development of 25 solar parks to accelerate solar capacity addition in various states. 3,000 MW of solar PV capacity will be established based on the model of bundling solar-generated power with unallocated thermal-generated power with fixed levelised tariffs.[40]

4.4 Phase II Batch III – state-specific VGF scheme

Solar projects of 2,000 MW capacity under state-specific VGF schemes will be set up in solar parks in various states. These are to be developed through the coordinated efforts of central and state agencies. Out of the total capacity of 2,000 MW, a capacity of 250 MW will be earmarked for bidding with DCR. The upper limit for VGF was kept at 30% of the project cost or Rs 10 million/MW for open category (Rs 13.1 million/MW for projects in DCR category), whichever is lower.[41]

4.5 Phase II Batch IV

SECI has been designated as the implementing agency for the selection of

37 See footnote 1 above.

38 See www.mnre.gov.in/file-manager/grid-solar/100000MW-Grid-Connected-Solar-Power-Projects-by-2021-22.pdf.

39 Final Guidelines for Selection of 750 MW Grid Connected Solar Power Projects, see www.mnre.gov.in/file-manager/UserFiles/final-VGF_750MW_Guidelines_for-grid-solar-power-projects.pdf.

40 Guidelines for selection of 3,000 MW Grid-Connected Solar PV Power Projects under Batch-II 'State Specific Bundling Scheme', March 2015, the MNRE.

41 Guidelines for implementation of scheme for setting up of 2,000 MW Grid-Connected Solar PV Power Projects with VGF, see www.gov.in/file-manager/grid-solar/Scheme-2000MW-Grid-Connected-SPV-with-VGF-under-JNNSM.pdf.

grid-connected solar PV projects for a cumulative capacity of at least 5,000 MW to be set up on a Build-Own-Operate basis through the VGF mechanism.[42]

4.6 Phase II Batch V

This is a scheme for setting up 1,000 MW of grid-connected solar PV power projects by the Central Public Sector Undertaking (CPSU) (ie, entities owned by the central government).[43] The scheme targeted public sector undertakings and organisations owned by the central government such as the NTPC, the NHPC, the Indian Railways etc to set up 1,000 MW of grid-connected solar power projects. These projects were mandatorily required to procure PV modules from domestic manufacturers.

4.7 Implementation of scheme for development of solar parks and ultra-mega power projects

This scheme proposes the establishment of 25 large solar parks (of at least 500 MW) at various locations across the country targeting around 20,000 MW of solar power installed capacity. However, due to the increased overall target for installed capacity of solar power from 20,000 MW to 100,000 MW by 2022, the target was increased from 20,000 MW to 40,000 MW to be achieved by 2019–20.[44]

The solar park offers, in a one-stop-shop format, civil and grid connection infrastructure facilities to incentivise private developers to invest in the solar park. The state government will nominate the implementing agency for the solar park and also identify the land. The development of solar parks can be done by SECI, any special purpose vehicle (SPV) under the state government, a joint venture company set up between SECI and a state-designated agency, or private entrepreneurs. The implementing agency will have the responsibility of providing suitably developed, levelled land with all clearances, transmission systems, water access, road connectivity, etc to the solar project developer. A total of 34 solar power parks were approved in 21 states with a combined solar capacity of 20,000 MW.[45]

4.8 Grid-interactive rooftop and small SPV power plants programme

Out of an ambitious 100,000 MW installed capacity target by 2022, 40,000 MW are targeted for rooftop solar installations.[46] The MNRE has recently declared financial incentives for DISCOMs to support rooftop solar installations. The MNRE notification proposes financial support of up to Rs 3.75 million (US$55,000)/MW for up to 1,350 MW of rooftop solar capacity.[47] There is a huge potential for generation

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42 Guidelines for implementation of scheme for setting up of over 5,000 MW Grid-Connected Solar PV Power Projects with VGF, see www.mnre.gov.in/file-manager/UserFiles/Guidelines-for-5000MW-Grid-Connected-power-project-under-VGF-NSM.pdf.

43 See www.mnre.gov.in/file-manager/UserFiles/Scheme-1000MW-grid-connected-SPV-batch_V-phase_II-JNNSM.pdf.

44 The scheme for enhancement of capacity from 20,000 MW to 40,000 MW for 'Development of Solar Parks and Ultra Mega Solar Power Projects' dated 21 March 2017, see www.mnre.gov.in/file-manager/UserFiles/Scheme-for-enhancement-of-capacity-to-40GW-Solar-Parks.pdf.

45 *Id*.

46 See www.mnre.gov.in/file-manager/grid-solar/100000MW-Grid-Connected-Solar-Power-Projects-by-2021-22.pdf.

47 See www.solarrooftop.gov.in/notification/Notification-08112016901.pdf.

of solar power using unutilised space on rooftops and on wasteland around buildings.[48]

The central government is implementing a programme where it is providing a subsidy of 30% of benchmark cost for the general category states and up to 70% of benchmark cost for special category states (such as states located in hilly areas or islands).[49]

The rooftop solar market in India has grown at a compound annual growth rate (CAGR) of 98% in the last four years. As of 30 September 2016, 1,020 MW of total rooftop solar capacity had been installed.[50] Growth in this market is being primarily driven by improvement in price competitiveness of rooftop solar power vis-à-vis grid power. However, grid interconnection regulations and processes remain challenging in most parts of the country, despite almost all states announcing net and/or gross metering policies for rooftop solar.

4.9 Scheme for setting up grid-connected solar PV projects by defence establishments

A capacity of 300 MW of grid connected and off-grid solar PV power projects is proposed to be set up by various defence establishments under the Ministry of Defence, with VGF support of Rs 7,500 million under JNSM.[51] The government has already given consent for the right of use of land by developers chosen by defence establishments such as the army, the navy and the Ordnance Factory Board.[52] The government has permitted these establishments to identify locations for developing solar projects anywhere in the country, including border areas.[53] These projects may be undertaken through a 'developer mode'[54] or an 'EPC mode' and must procure PV modules from domestic manufacturers.[55]

4.10 Pilot-cum-demonstration project for development of grid-connected solar PV power plants on canal banks and canal tops[56]

This scheme aims to gainfully utilise the unused space over the top of canals and unutilised land on canal banks for setting up solar PV power generation plants, up to a total capacity of 100 MW. Since these properties are owned directly or indirectly by the government (central or state), it may make it easy for the MNRE to execute the proposed projects.

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48 See footnote 1 above.
49 *Id*.
50 See India Solar Rooftop Map 2016, Bridge to India, www.bridgetoindia.com/reports/india-solar-handbook-2016/.
51 See footnote 1 above. See also http://mnre.gov.in/file-manager/UserFiles/administrative-approval-on-Defence-300MW.pdf.
52 *Id*.
53 *Id*.
54 Under the 'developer mode', the developer is permitted to bring in investment, own the project and supply power to respective defence establishments.
55 The 'EPC Mode' involves projects being built by EPC contractors and investment being made by defence establishments.
56 See www.mnre.gov.in/file-manager/grid-solar/Administrative-Approval-reg-Pilot-cum-Demonstration-Project-for-Canal-Bank-Canal-Top-Solar-PV-Projects%20.pdf.

4.11 Off-grid solar photovoltaics

MNRE is also subsidising off-grid and decentralised applications for usage of solar PV products in remote areas where grid penetration is neither feasible nor cost effective.[57] This is consistent with JNSM's general objectives. For instance, the central government is providing capital subsidy for solar PV plants with battery storage in a micro-grid mode for unmatched community demand for electricity or in unelectrified rural areas.[58] Further, a special programme for 100,000 solar-powered water pumps was launched of which 31,472 solar-powered pumps were installed in the year 2015–16.[59] This is higher than the total number of pumps installed during last 24 years (ie, since beginning of the programme in 1991).[60]

4.12 Other regulatory measures

(a) Renewable energy purchase obligations

SERCs are required to specify that a certain percentage of the total electricity purchased by a distribution licensee should be electricity that is generated through renewable sources. This is known as the renewable purchase obligation (RPO).[61] For example, in the state of Rajasthan, the Rajasthan Electricity Regulatory Commission (RERC) has notified 4.75% and 6.75% as solar energy purchase obligations for the years 2017–18 and 2018–19, respectively.[62] In addition, the RERC has also fixed the RPO for non-solar renewable energy. However, some states and regulatory bodies have not been strictly enforcing RPO obligations. In this regard, the Supreme Court[63] set a precedent by ruling that fulfilment of RPO is mandatory for captive power plants and open access consumers. This is a positive development and will help in enhancing RPO compliance and further contribute to renewable energy growth in the country. Further, pursuant to the revised National Tariff Policy (Tariff Policy),[64] SERCs are required to ensure that this percentage/RPO reaches 8% of total consumption of energy, excluding hydro power, by March 2022.[65]

(b) Renewable energy certificates

RPOs can also be discharged by purchasing renewable energy certificates[66] (RECs) from any of the power exchanges. Entities which are not able to comply with their RPOs by purchasing power can purchase RECs and achieve compliance.

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57 See footnote 1 above.
58 *Id*.
59 See http://pib.nic.in/newsite/printrelease.aspx?relid=161811.
60 *Id*.
61 Section 86(1)(e) of the Electricity Act.
62 Regulation 4 of the Rajasthan Electricity Regulatory Commission (Renewable Energy Obligation) Regulations, 2007.
63 *Hindustan Zinc Limited v Rajasthan Electricity Regulatory Commission* [Civil Appeal 4417 of 2015] dated 13 May 2015.
64 See www.kseboa.org/downloads/Government%20Orders/tariff_policy-resolution_dated_28012016.pdf.
65 The Tariff Policy notified by Government on 28 January 2016.
66 The Central Electricity Regulatory Commission (Terms and Conditions for Recognition and Issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations, 2010.

(c) ***Renewable generation obligations***

Tariff Policy notified by the central government, and referred above, has introduced the concept of renewable generation obligations.[67] Any generating company proposing to build a coal/lignite-based thermal power generation station after a specified date will be required to build renewable energy generating capacity or procure and supply renewable energy equivalent to such capacity, as may be prescribed by law.

(d) ***Exemption from inter-state transmission charges***

In order to further encourage renewable sources of energy, the Tariff Policy has also proposed to not levy inter-state transmission charges and losses on transmission of electricity generated from solar energy through the inter-state transmission system for a notified period.[68]

(e) ***Net-metering***

Net-metering is a relatively new concept which, pursuant to a special metering and billing agreement between the utilities and their customers, enables the connection of small, renewable energy-generating systems to the power grid.[69] When the net metering client's generator is producing more power than is being consumed by such client, the electric meter runs backwards, thereby generating credits. If the client uses more power than is being produced, the meter works normally. The client is only charged for the net power that he/she has consumed from the electricity supplied by the utility.

(f) ***Tax benefits***

Supply of solar water heating systems, solar power-based devices, solar power-generating systems and solar lantern/solar lamp and parts for their respective manufacture is subject to a goods and services tax at a concessional rate of 5%. With effect from 1 April 2017, for assets relating to solar power generating systems, machinery and plant, the Income Tax Act 1961 has provided a rate of depreciation of 40%. An additional depreciation rate of 20% in the first year of use of a new asset, being plant and machinery is also provided.

(g) ***Projects under various state policies***

Along with measures taken by the central government to promote solar power under the JNSM, various states have come up with their own policies to provide an enabling framework for growth of renewable energy in India.

(h) ***Full repatriability***

Indian exchange control regulations which, among other matters, govern foreign investments into India, permit 100% foreign investment in the solar power sector in India, either as a manufacturer of equipment, or as a project developer. In other

67 Paragraph 6.4(5) of the Tariff Policy.
68 Paragraph 6.4(6) of the Tariff Policy.
69 See www.mnre.gov.in/file-manager/akshay-urja/january-february-2012/EN/44-45.pdf.

words, a foreign person or entity is allowed to own a 100% shareholding of an Indian company set up to undertake the business of manufacture of solar equipment or project development. Further, subject to payment of applicable taxes, the profits from such businesses and capital invested is fully repatriable.

5. Major issues or risks faced by solar power developers in India

The two primary goals of the developer of a solar power project are commercial viability and bankability. Commercial viability of the project is ensured when the project is executed on a fixed timeline without compromising on technical quality and performance standards and when the project developer's expectation of a reasonable return and sustainable profits from the project are met. Bankability of the project means the ability of the project developer to secure finances/funds for the project at favourable terms.

However, these goals of the project developer have to contend with major issues of time and cost overruns, due to various inherent risks. The issues or risks prevalent in the renewable power industry in India are discussed below.

5.1 Environmental issues

Solar energy is universally understood to be environmentally friendly technology as it has "zero emissions while generating electricity or heat".[70] However, for setting up a solar power project, subject to applicable conditions, consent to establish/operate under the Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981 and authorisation under the Hazardous Wastes (Management and Handling) Rules 1989 must be obtained. Further, the disposal of PV cells has to comply with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016, hence pre-authorisation from authorities must be obtained.

The recently issued Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Solar PV Power Projects dated 3 August 2017[71] by the Ministry of Power, provide that in cases where the procurer of electricity has identified land, it shall also, in order to ensure timely commencement of supply of electricity, procure NOC or environmental clearance for forest clearance, as the case may be. Obtaining the aforesaid consents/NOC/clearances could be time consuming and may impact timely commissioning of the project.

5.2 Real estate and planning (zoning) issues

(a) Land acquisition

Availability of real estate is a key requirement and constraint for setting up solar power projects. At the same time, the real estate used by a solar park leaves it useless for other purposes, as the solar modules are permanently stationed on the land. The increase in the target-installed capacity for solar power parks from 20,000 MW to

70 Paragraph 2.4 of JNSM.
71 See www.mnre.gov.in/file-manager/UserFiles/Guidelines_for_Tariff_Based_Competitive_Bidding_Process.pdf.

40,000 MW may itself require around 80,000 acres of land.[72] In India, finding suitable land for a project and securing its possession is one of the major challenges faced by the project developers. Also, land ownership is highly fragmented and tracing the true ownership of land by title due diligence is difficult as records are not maintained properly by local land revenue authorities. Further, if the land falls under the category of a heritage site, a forest reserve or a wildlife sanctuary, its acquisition may face stiff resistance from local authorities, social activists and the local population.

(b) Planning (zoning) issues

Indian law categorises land use into different categories and various states have their own regulations in this regard. For example, land which has been classified as being for residential, commercial or agricultural use cannot be used for setting up a solar power project. In some instances, conversion of land use is possible after following due process. Conversion of land use requires payment of charges and acquisition, leasing or licensing of land is also subject to payment of stamp duty, a form of tax, to the relevant state government within whose jurisdiction the relevant land is located.

Since levy of land use conversion charges and stamp duty are, as per the Constitution of India, within the domain of each state government, the MNRE has put the onus on[73] states to provide the solar power industry with exemptions from the same. Certain states such as Rajasthan and Karnataka have removed land use conversion charges.

5.3 Grid unavailability risks

There is a general shortage of power transmission infrastructure in India and this factor constrains offtake of electricity for solar power plants. With the exception of solar parks for which a state is required to provide specific infrastructure for transmitting electricity, there is a shortage of proper infrastructure. There is a pressing need for transmission utilities to expedite creation of quality transmission lines to enable timely offtake of electricity. Further, the power grid in India is subject to stability problems. Solar power, being more intermittent than conventional power, poses an important challenge to grid stability.

5.4 Local issues

In some instances, the process of land acquisition may require displacement of sections of the population and issues of payment of compensation. If the land being acquired is located in environmentally fragile areas, land acquisition may become subject to opposition from various advocacy groups and organisations in the non-government space. The nature of these issues is such that local political and vested interests also tend to get involved and rally the local population against these projects. This may then result in the timeline for the relevant projects being impacted.

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72 "Govt's Big Solar Park Push Could Run Into Land Acquisition Hurdle", *The Quint*, 27 March 2017, see www.thequint.com/news/india/solar-parks-and-land-acquisition-problems.

73 *Id.*

5.5 Financial health of DISCOMs

The poor financial condition of the DISCOMs, which are the consumers for most of the solar power plants, represents a significant risk factor. Payment delays or non-payment by DISCOMs may have a significant impact on the sector as a whole. However, as mentioned in section 3.4 above, the government has introduced the Uday scheme to address problems faced by these utilities, including a reduction of their losses and improvement in overall operations.

5.6 Rise in cost of solar modules/cells and other factors

Due to cost-efficient Chinese supplies of PV modules, India has been able to reduce the tariff for solar power to less than, or comparable to, the tariffs for conventional power sources. Modules account for about 55% of the project cost of a solar project and 80% of them are imported from China and Malaysia. If, for whatever reason, their prices rise, it could significantly impact the economics of these projects. This may then arrest the trend of continuously falling solar tariffs and thus adversely impact the future growth of the solar power sector.

In addition to the inherent risks in development of any project in India discussed above, the solar power developer also faces:

- risk of termination of a PPA due to unreasonable delay in the commissioning of the project;
- risk of loss of VGF if the project fails to generate power continuously for any year or its assets are sold or the plant is dismantled during the tenure of the project; or
- given the continuously falling tariffs for purchase of solar power by state and central government utilities, risks arising from certain utilities requiring higher tariffs in the earlier PPAs to be reduced to such lower tariffs.

5.7 Management of issues and risks

It is important for the project developer to identify risks, mitigate them appropriately and allocate them among the different project participants. An important method to manage risk is to choose a capable and experienced EPC contractor for construction of the project and agree to time-certain fixed-price contracts. Procurement of equipment with the right quality and specification is important to ensure that the degradation factor is managed and the project continues to produce power without any breakdown or interruption. Obtaining suitable warranties under the EPC contract also helps in managing the disruption arising from equipment breakdown and protects the developer against the financial impact of such breakdown.

Risks are also managed by having well-drafted PPAs which provide for a clear obligation on the utility to pay at a specified time, provide for a good payment security mechanism and with *force majeure* provisions that capture events that are outside the control of the developer and excuse non-performance under the PPA upon their occurrence.

5.8 Financing related issues

Some issues that directly impact the ability of the project developer to raise financing to construct and operate a solar plant are discussed below.

(a) ***Assignment of rights under PPAs***

Often PPAs entered into with DISCOMs require the prior consent of such DISCOMs to assign the rights under the PPA to a substitute developer in case of default by the original developer/borrower. Such consents for assignment are usually provided for as conditions subsequent in financing arrangements, and are, at times, cumbersome to obtain. Greater clarity on the mechanism for obtaining such consents and requiring these consents to be provided in a timely manner would provide comfort to lenders, and would encourage them to lend more to solar power projects.

(b) ***Lack of clarity on enforcement of mortgages***

Most states' solar project policies require DISCOMs or other government agencies to provide/arrange for land required for solar projects. Such land-related arrangements are in the nature of leases or, in rare cases, outright conveyance of the underlying land. However, in most cases, the underlying documents provide for the consent of the lessor or the seller of the land or any government agency for the granting of mortgages over the land by the solar developer. Such consents are also not easily forthcoming, and thereby act as a disincentive for lenders to provide financing for solar projects.

(c) ***Change in shareholding of a solar project developer***

PPAs generally contain provisions requiring the solar project developer to ensure that no change in its shareholding occurs for a certain period of time. While consent can be obtained from the relevant DISCOMs or government agencies for a change in shareholding, the process for obtaining such consent is generally cumbersome. This acts as a disincentive for private equity funds to invest in solar project developers by way of equity. Additionally, as lenders generally require a debt-to-equity conversion covenant in case of default, the lack of clarity on change of shareholding is a disincentive for them to provide financing for solar power projects.

(d) ***Signing of PPAs***

There have been reports in the public domain on DISCOMs refusing to sign PPAs or delaying signing PPAs with a view to seeking renegotiation of rates as discussed in greater detail in section 6 below. Given that the primary credit comfort for lenders is the income generated through contractually secure offtake arrangements, such failure to execute PPAs on agreed terms would be a disincentive for lenders to provide financing to solar power projects.

(e) ***Specific joint venture-related issues***

The above issues would also apply where a solar project is being developed by the project developer in joint venture with an Indian party or an overseas party. However, a notable specific issue that some overseas joint venture partners have faced is their inability to exit the joint venture, as PPAs in some states tend to contain a 'lock in' of shareholding covenant – ie, a covenant that the shareholding of the solar project developer will not change for a particular time period after the signing of the PPA. Such conditions may discourage overseas parties from forming joint ventures to operate solar power projects in India.

6. Power offtake arrangements

The primary driving force behind the solar power growth story is the guarantee given by the DISCOMs to purchase power for a minimum 25-year period at a fixed rate under a PPA executed with power project developers. Solar power developers generally enter into PPAs for the offtake of electricity generated from the solar power plant. The entire bankability of the project and investment made by a developer depends on the continued existence and validity of the PPA.

As mentioned above, SERCs are required to prescribe RPOs (which also include solar purchase obligations) for certain categories of consumers. The solar purchase obligations as part of the RPO prescribed by the SERCs offer assured offtake to solar power developers.

Since the PPA period influences the tariff by determining the period over which the investment is returned to the investor, longer PPAs are preferred. However, due to a steep fall in tariffs for renewable energy power plants (including solar power plants), certain DISCOMs have attempted to renegotiate or cancel signed PPAs with wind and solar power developers as they were executed at a much higher price than the current rate.[74] These actions by DISCOMs have clearly introduced a degree of uncertainty into the sector.

7. The future for the solar power sector in India

7.1 Capacity addition target missed – 2016–17

Amid all the euphoria arising from record capacity additions in renewable energy (including solar power plants) in 2016–17[75] and capacity additions in the renewable energy sector being at par with capacity additions for thermal power,[76] one cannot ignore the fact that against the targeted capacity additions for solar power for 2016–17 of 12,000 MW, India achieved only 5,526 MW, although this itself was a record as far as capacity additions in the solar power sector was concerned.[77] This is less than 50% of the target and is particularly concerning as the target for 2017–18 is even higher at 15,000 MW and any shortfall may hinder India meeting its target for installed capacity by 2022.[78] The future of the solar power sector, in particular solar power generation, will significantly depend upon the governmental policies, rules, regulations, their execution and how they address the issues and risks discussed in this chapter.

7.2 Conclusion

India has set a very ambitious target of 100 GW of installed capacity for solar power by 2022. This has already started acting as a catalyst in the power sector as is evident

74 See www.deccanchronicle.com/business/economy/210817/ppa-renegotiation-by-state-discoms-to-impact-re-sector-icra.html.
75 See www.thehindubusinessline.com/economy/capacity-additions-in-renewable-energy-on-par-with-thermal-power-in-201617/article9679836.ece.
76 *Id.*
77 *Id.*
78 See http://mnre.gov.in/file-manager/UserFiles/OM-year-wise-cumulative-target-for-100000MW-grid-connected-SP-project.pdf.

from different announcements made in India regarding cancellation of coal-fired power plants.[79] Some of these projects had become unviable as they were dependent on imported coal and could not compete in a scenario of abundant supply of renewable resources in India at comparable prices.[80] As of 30 June 2017, installed solar power capacity in India was 13,114.85 MW, roughly 3.98% of total installed capacity in India, while for the thermal power sector this figure was 219,449.5 MW which translates to more than 66%.[81]

While an argument can be made that solar capacity growth targets set by India are overly ambitious, in practice commissioning of new projects has gathered considerable pace. If India is able to achieve the targets, it will help reduce the country's carbon footprint significantly. This will not only have a positive impact on the environment and prospects for solar plants in India, but also help in reducing a huge outflow of foreign currency. Despite several issues that remain with the sector, the government should continue to formulate favourable policies for the sector, attract domestic and international capital and assure growth for all stakeholders.

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79 See http://ieefa.org/ieefa-asia-indias-electricity-sector-transformation-happening-now/.
80 *Id*.
81 See www.cea.nic.in/reports/monthly/installedcapacity/2017/installed_capacity-09.pdf.