

Ensuring access to affordable, reliable, sustainable, and modern energy for all is one of the goals of sustainable development. In order to meet the increasing demand for various forms of energy—whether derived from fossil fuel, nuclear substances, or renewable sources—conservation, equitable use, and efficient management of its usage have gained primacy. *Energy Law and Policy* provides a constructive understanding of energy law, a relatively new area in the discourse of environmental law. It argues the importance of looking into existing legal imperatives to frame a robust, and comprehensive legal framework on renewable energy at national and international levels.

In this volume, leading energy law experts shed light on crucial aspects of energy law, such as the linkages between energy and sustainable development, energy trade, energy tax, and intellectual property rights in clean energy. Providing a comparative perspective, the volume discusses domestic laws of India, China, Mauritius, and Nigeria, and links the legal instruments developed by environmental law to an energy regime where economic motives dominate and differ across nations depending on the availability of their natural resources.

Usha Tandon is professor of environmental law, population law, and gender justice at Campus Law Centre, University of Delhi, India.

Contributors

- Abdul Haseeb Ansari • Upendra Baxi • Neelakshi Bhadauria • Klaus Bosselmann • V. Chandrlekha • Pranay Chitale • Jeeraj Kumar Gupta • C.M. Jariwala • Akash Kumar • Surender Kumar • Shushpa Kumar Lakshmanan • Amar Roopanand Mahadew • Arimma Gloria Orié • Nikita Pattajoshi • Armin Rosencranz • Shivvananda Shetty • Pratibha Tandon • Usha Tandon • Anjay Upadhyay • Maansi Verma • Rajnish Wadehra • M. Afzal Wani

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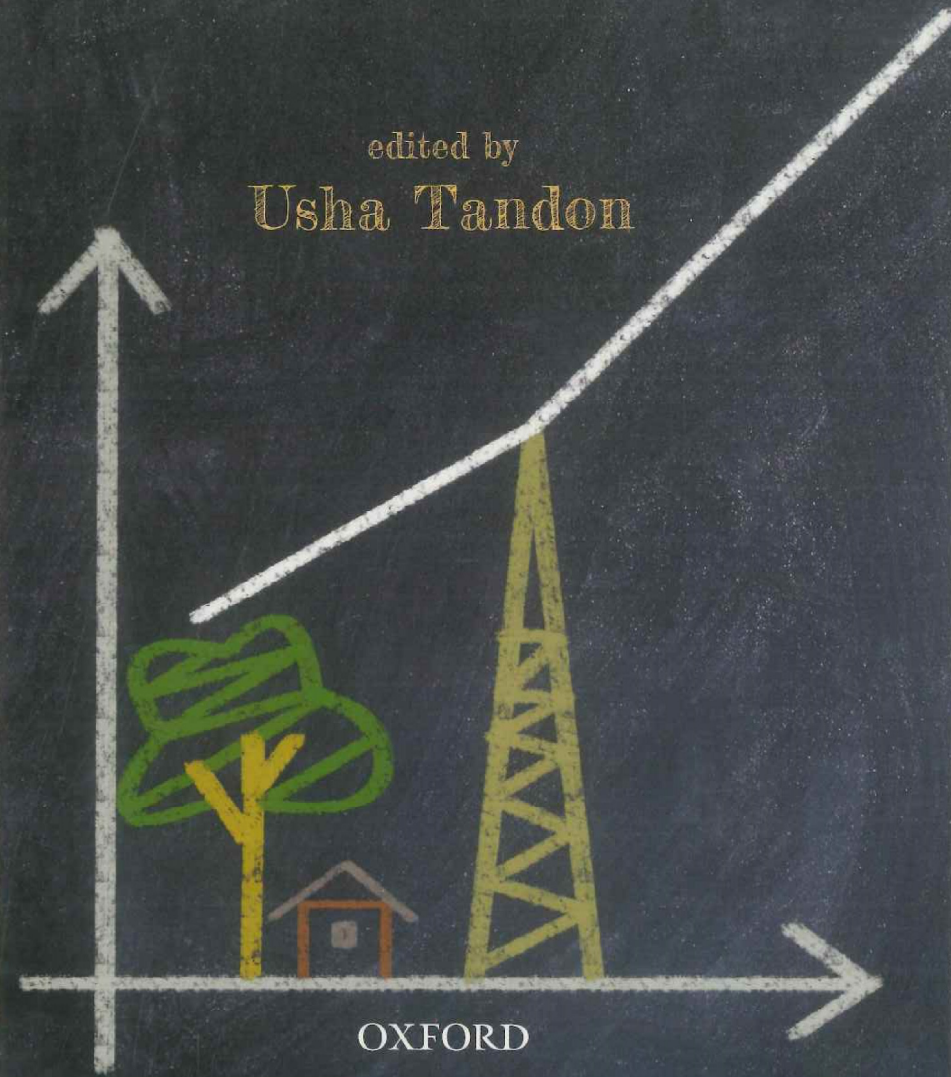
Energy Law and Policy

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Foreword by **Richard L. Ottinger**

ENERGY LAW AND POLICY

edited by
Usha Tandon



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To
my beloved Anil
for
regulating my energy for a sustainable relationship

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67. Barton, 'Intellectual Property and Access to Clean Energy', p. 18.

68. See, generally, Mittal, *Licensing Intellectual Property: Law and Management*, p. 425; *Georgia-Pacific Corporation v. United States Plywood Corp.*, 318 F Supp. 1116 (1970) [Provides useful checklist of 15 factors to be checked in case of a patent license, in the context of determining a reasonable royalty as damages for infringement].

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77. Subbarao, 'International Technology Transfer to India an Impedimenta & Impetuous', p. 14.

78. Subbarao, 'International Technology Transfer to India an Impedimenta & Impetuous', p. 13.

79. See Lane, 'Going Round on IP and Climate Change'.

PART II

NATIONAL PERSPECTIVES

ARMIN ROSENCRANZ
RAJNISH WADEHRA
NEELAKSHI BHADAURIA
PRANAY CHITALE

Clean Energy in India

Supply and Prospects

Electricity is vital for human well-being and betterment in any developing nation. The benefits of electricity are far reaching and go beyond economic considerations. India's electricity sector requires immediate attention. An average Indian rural household receives only a few hours of electricity per day. This gives an entire family a limited space to do their basic household chores. The uses of electric heaters or gas stoves are alien to many rural households. Even in urban households, electricity is not subsidized, leaving a marginal migrant worker with skyrocketing electricity bills. India is a densely populated country, comprising 17.74 per cent of the world's total population.¹ This figure is projected to rise to 18.90 per cent by the end of 2022.² In relation to its population, India's electricity production is negligible.

The lack of electricity corresponds to the failure on the part of the government to provide electricity in an efficient and cost-effective manner. India has an enormous renewable and non-renewable electricity pool. India's generation capacity is 303 gigawatts (GW) of which about 212 GWs is thermal or fossil fuel-based generation capacity, about

46 GWs is hydroelectric capacity, about 43 GWs is renewables, and about 5 GWs is nuclear power.³

The present scenario is undergoing a shift. India is gearing to transform its electricity sector towards a greener and more reliable side, and is revamping its energy sector by utilizing its renewable stocks. India is striving to achieve a target of producing 175 GW of electricity from renewable sources by 2022.⁴

This ambitious target coupled with a rapid growth in population and industrialization is a challenging task for all participants, public and private alike. There is significant criticism⁵ and doubt as to how India is to achieve this target unilaterally set by Narendra Modi, Prime Minister of India.

According to the Central Electricity Authority (CEA), the per capita electricity consumption reached 1075 Kwh in 2014–15.⁶ Despite being an increase from the preceding years, India is lagging far behind developed countries, which have average per capita electricity consumption at around 15,000 kWh.⁷ India is consuming about a quarter of what the average Chinese person consumes and 8.5 per cent of what an average American consumes (Bhaskar 2015). India's per capita emissions are among the lowest in the world in light of its high population.

There is a pressing need to increase India's per capita consumption in order to achieve growth and economic development. But the targets set in India's Intended Nationally Determined Contributions (INDCs) presented at the 2015 Paris climate meeting means that India has committed, in effect, that its economic development agenda would not be at the cost of degrading the environment. It has a responsibility to the environment and the world to sustainably generate renewable electricity.

Right to Electricity and the Electricity Act, 2003

To provide a fundamental right to electricity is no longer a distant dream in India. The government is on its path to electrifying the remaining 18,452 villages.⁸ However, unrealistic electricity prices are a cause of concern for the government. Electricity utilities have failed in managing generation, transmission, and distribution companies (gencoms, transcoms, and discoms) in an effective manner. Even factories bear the price of paying unrealistic prices. This, as a result, affects the consumers in

the form of increased prices of all household goods produced by such factories. Thus, when electricity is made available at very high costs, the burden is entirely on the consumers. To facilitate the development and to enhance the nation's GDP, cheap power must be provided directly to the consumers and small and medium enterprises. A rights based approach would enable a consumer to ensure electricity at a reasonable price mandated by law.

The Electricity Act of 2003 (Act) has taken some bold steps to transform power generation in India. The erstwhile electricity boards have been dismantled under this Act to form gencoms, transcoms, and discoms. However, the three wings have not been made efficient or privatized due to political clashes. Regulatory bodies have strictly implemented the fixed return stipulated by the Act. This helps utilities load a fixed return on all their investments and the burden is passed on to the consumer. There is no focus on efficiency, and in fact over 23 per cent of India's power is lost in Aggregate Technical and Commercial Losses (AT&C Losses), which are an unexplained camouflage for theft and inefficient working of the discoms and transcoms.⁹

In December 2015, COP 21, under the United Nations Framework Convention on Climate Change (UNFCCC), set up strong goals to change the global climate policy. The treaty did away with the differentiation between developed and developing countries, thereby making all countries accountable to achieve their set targets. The treaty put an obligation on every country to report their emissions and implement their efforts. This would in turn be subject to international review.¹⁰

Environmentalists and climate advocates have looked down upon the Paris Agreement with a certain level of uncertainty and scepticism. The reduction of greenhouse emissions by reducing carbon dioxide emissions was appreciated. This would in turn facilitate in achieving the difficult goal of keeping temperatures below two (2) degrees Celsius. The 'Ratchet mechanism' for 2015 commitments, also known as 'ambition mechanism', was approved. This mechanism allows for commitments to climate change to become more progressive and ambitious with time and allows for review of progress every five years.¹¹

However, environmentalists and climate advocates deplored the non-focus on sea level rise; the lack of any mechanism to hold countries accountable for any commitment made in Paris; the absence of any pledge to leave fossil fuels in the ground; the absence of any plan to

upgrade electricity grids or to develop adequate storage for excess wind and solar energy; no mention of clean coal technologies such as IGCC, coal gasification, supercritical, carbon capture, and geological storage; no incentives to the private sector to develop and market low-carbon energy technologies; no coverage of aviation or shipping; and no firm promises on climate finance or technology transfer.

India's Electricity Scenario

Overview

Despite failing to directly address certain factors, the Paris Agreement aimed to be extremely ambitious. India, like other nations, has devised its own contributions (INDCs) to achieve targets. The main argument put forth in this chapter is that India's set target is overly ambitious and is unlikely to meet any of its renewable energy commitments in Paris. India's government has declared that it will restrict energy provided by fossil fuels to 40 per cent of its total energy needs by 2035, reduce greenhouse gas emissions intensity of its GDP by 33 per cent and create a carbon sink of 2.5 billion tonnes of CO₂ equivalent through re-forestation.¹²

There are four major factors governing India's energy policy challenge today:

1. There is a requirement to move to renewable power. To achieve this, India needs to tap as much power from coal, gas, diesel, hydro, and nuclear to reach its promised energy potential. Therefore, India struggles to increase all—traditional fossil fuels, nuclear, as well as renewables.
2. There is inefficient management of electricity, resulting in enormous AT&C Losses. Such losses need to be reduced to ensure efficiency.
3. There is huge public resistance faced by state government-owned distribution companies (discoms) to realistically price the cost of electricity to consumers. This has led to huge accumulated losses, which are putting pressure on state treasuries and banks. These losses are backed by government guarantees, but their sheer size—Rs 3.80 lakh crores or about \$60 billion and growing every year, is worrying.¹³

4. India desires to present itself as a good global citizen. It is the third highest greenhouse-gas-emitting nation in the world after the US and China.¹⁴ Before Paris, India had already promised low-carbon energy improvements to the US under the Energy Cooperation Agreement of January 2015.¹⁵

The fine balance that India manages to achieve in this situation is key to India's future growth and development, as well as its global standing. The Modi government's will and resourcefulness is being tested under this stress. India's bold solar, wind, and biofuel initiatives have been showcased, though not a part of its INDCs, as a bold move engineered to draw admiration. These have managed to get India off the hook from promising any absolute reductions in either its carbon emissions or its coal production.

India has also retreated from its prior position of leading the G77 countries to protest and insist on the 'polluter pays' principle of getting developed nations to pay them for switching to renewables. The West has promised a climate change fund of \$100 billion in 2020 whereas countries in Asia Pacific (specifically India) would now require an investment of \$2.5 Trillion.¹⁶ In the current slowdown, it cannot be expected that India, even though it carries weight in being a \$2 Trillion economy, its G77 friends cannot hope to raise funds anywhere near the huge amount that would be required for a successful and time bound makeover.

Renewable Energy in India

India is in the midst of operating the world's largest capacity development agenda, with a tense deadline of 2020. In June 2016, India recorded about 44 GW of total electricity produced from its renewable resources.¹⁷ This figure is a long way from its target of 175 GW. Presently, India has four years to increase its solar generated electricity from 7 GW to 100 GW, wind generated electricity from 27 GW to 60 GW and biofuels from 5 to 10 GW.¹⁸ (See below). Generation from renewable sources will need to increase dramatically in the next four years.

Even though the share of renewable energy in the total power generation has increased from 4.97 per cent in 2012 to 5.7 per cent in

2016, the percentage of growth of renewable energy requires a major enhancement to achieve the targets set in the INDCs.¹⁹ India is unlikely to achieve this target owing to the fact that the growth of renewable energy in India is slow and time consuming, as discussed below. It requires a major boost in infrastructure, funds, and policies. A number of pressing issues in the present established electricity generation sector require immediate attention and action.

The Ministry of New and Renewable Energy (MNRE) has prepared a state-wise blue print for tapping renewable energy from state stocks. The question arises as to whether India will stick by the targets set, as these top down driven targets seem to be passing the burden to the states to meet the central government's ambitious goals. Also, in the process, these goals are now being listed as a target for 2022 instead of 2020. The amount of generation intended in each region prescribed is: Northern region 46319 MW (further divided among solar, 31120 MW, 8600 MW Wind, 2450 SHP, and 4149 MW Biomass), Western region 54010 MW (28410 MW solar, 22600 MW wind, 125 MW Small Hydro Power (SHP), and 2875 MW Biomass), Southern Region 56650 (26531 MW solar, 28200 MW wind, 1675 MW SHP, and 2612 MW biomass), Eastern Region 12616 MW (12237, 135, and 244 MW Solar, SHP, and Biomass respectively) and North Eastern Region 1820 MW (1205 and 615 MW Solar and SHP).²⁰

Renewable Energy Target of 175 GW

India has set the goal to increase its renewable energy capacity (excluding hydro power) to 175 GW by 2022. Out of this ambitious goal, Solar PV is to be 100 GW (of which 40 GW is expected to come from rooftop solar installations),²¹ 60 GW wind, and 10 GW biofuel-based power. The 175 GW renewable energy target is further complicated by India's commitment at the latest Paris climate conference to reduce carbon emissions to 30–5 per cent and increase renewables to 40 per cent of the energy mix by 2030.²²

In order to scale up renewable energy output as planned, India will need an investment of \$ 140 billion over the next six years.²³ Most of this is being sought from a hesitant private sector, driven by the state government auctions for setting up solar farms with certain subsidies provided by the state and central governments. But the industrial climate in the country is poor, and returns on investments in solar are falling rapidly

with competitive bidding in the tenders so far called by some states. With high NPA (Non-Performing Assets) levels of Indian public sector banks, some of these bids could result in poor returns, thereby crippling the chances for setting up these renewable energy capacities.²⁴

In a rush to showcase efforts towards achievement, however, Minister Piyush Goyal went on record to state that the target of 100 GW of installed capacity of solar energy can be achieved by the end of 2017 itself, which seemed outrageously ambitious.²⁵

Even though the government has talked up the usage of renewable energy in order to meet its set target of 175 GW, it seems highly unlikely. In particular, to meet India's solar target of 100GW by 2022 would imply average annual solar capacity additions of over 16 GW; a similar level has so far been observed only in one year in one country (China).²⁶ To achieve this target would mean attracting large capital funds, taking steps to ensure that projects are financially robust, that land is available, and that regulatory approvals are granted rapidly.²⁷ This target therefore seems preposterous. In order to achieve this target, government will have to aim towards large public-private partnerships and foreign investments; it will have to persuade, induce, and incentivize Indians to get on board and contribute for the good of the country.

The Indian government has been unable to allocate the substantial capital needed to increase India's 2016 budget aimed towards 100 per cent electrification in India by 2018.²⁸ The huge financial debts faced by State utilities (Discoms) and the huge NPAs faced by its banks are areas of concern that the government must tackle effectively while raising funds for renewable energy targets. Several billion dollars of debt on state power utilities has prevented the government from measurably increasing renewable energy despite consistent ambitious targets.²⁹ This fact has only been strengthened by the failure of the so-called Renewable Energy Certificate scheme, and low compliance with the renewable purchase obligation (Mittal 2015).

Sources of Renewable Energy

Solar Energy

Solar energy development is highly feasible as India receives 300 days of natural sunlight over an extensive landmass of nearly three million

square kilometers.³⁰ In the 2015 budget and INDCs, the government decided to drastically enhance its solar energy target from 20 GW to 100 GW.³¹ The five-fold increase is met with extensive speculation and criticism, as measures taken by the government are minimal as compared to the ambitious targets.

To achieve the target, incentives and schemes established by the government ought to have been working in full swing, aiming to rapidly increase solar energy production. However, facts indicate that there are a number of constraints, even at the grass roots level, making the target unachievable. As of May 2016, there are only 10 GW of solar projects under development and 8.4 GW that are anticipated to be auctioned in the second half of 2016–17.³²

However, the government has stepped up its fiscal and promotional incentives to increase investments in the solar energy sector and thereby increase production. It has made provisions for ensuring capital subsidies, tax holidays on earnings for 10 years, generation based incentives, accelerated depreciation, and viability gap funding (VGF) to ensure a greater inflow of capital from private players.³³ The government has further made facilities for financing solar rooftop systems as part of home loans,³⁴ concessional excise and custom duties, a preferential tariff for power generation from renewables, and foreign direct investment up to 100 per cent under an automatic route (no requirement of government approval).³⁵ Further, the government has introduced renewable purchase obligations set at 8–10 per cent, whereby non-renewable energy suppliers are mandatorily required to buy certain solar energy.³⁶

Despite establishing incentives and schemes, there are a number of concerns pertaining to the solar industry:

1. The renewable purchase obligations have implementation issues. The obligation is not implemented by the government and consequently, not adhered to by the utilities.
2. The solar electricity tariffs have reached an unprecedented low, posing a serious issue in the market. Potential investors bid extremely low tariff rates to win a tender, creating an aggressive bidding trend.³⁷ As a result, investors may not be able to sustain their business at such low rates, creating an unstable market at a very early stage and making it extremely difficult to earn a return on their investments.³⁸ Solar tariffs have fallen to an unprecedented low of

Rs 4.34/kWh (a drop of about six per cent between April and July 2016).³⁹ Domestic banks have raised concerns about low tariff rates and are reluctant to fund projects below Rs 5/kWh.⁴⁰ However, developers hope that in the time period between bidding and procurement, module and balance of system (BOS) costs will continue to drop along with interest rates to make these projects feasible, as most such projects are slated for commissioning by 2017.⁴¹

3. In addition to low tariffs, there is already a scarcity of funds in India's renewable energy sector. Even though the government has approved a number of major projects in India, there limited funds to finance solar investment projects.⁴² Requisite funds for provision of the VGF support will be made available to MNRE from the National Clean Energy Fund (NCEF) operated by the Ministry of Finance.⁴³ However, the funds earmarked are insufficient to make the scheme successful.
4. The international market for solar energy is on a downfall. Sun Edison Inc., a US based company, which was due to set up a number of solar power plans in India, filed for bankruptcy on 16 April 2016 in the New York Federal Court.⁴⁴ This has caused a regression in the market, as almost 1.3 GW of clean energy projects are up for sale.⁴⁵ This implies that even sanctioned and planned projects could be scrapped in the near future if investors are not ready to take up Sun Edison's pending projects. In light of the Sun Edison crisis, it is imperative for government to relax nearing deadlines set by power purchase agreements for investors to take up left-over projects. The government needs to take measures to prevent the Indian clean energy market from falling apart.
5. The lack of available technology for solar storage spells trouble for the Indian market.⁴⁶ Solar storage could be used to reduce energy fluctuations, thereby facilitating inter-state energy transfer.⁴⁷ This would also allow solar power plants to produce more electricity and transfer energy in the absence of sunlight.⁴⁸ Solar storage would increase the solar tariff by a considerable amount.⁴⁹ Such technology has not been developed and its costs have not been taken into consideration when investors bid for tariffs below Rs 5/kWh. Adding storage costs could increase the cost of solar energy to a whopping Rs 14/kWh.⁵⁰ The government might provide subsidies and take in such storage costs. However, as stated above, the govern-

ment has an immense deficit of funds to even finance projects as low as 5 GW. Storage and warehousing are important concerns if the government has any intention of achieving its 2022 targets.

6. 100 GW of solar energy is likely to produce only 30 GW to 40 GW of electricity.⁵¹ Taking factors such as night, dust, rain, cloud cover, or snow would reduce electricity generation. Most solar arrays being set up today are not equipped to manoeuvre their direction according to the changing course of sunlight (Rosencranz 2016). A majority of PV solar panels are fixed in position owing to cost reduction considerations (Rosencranz 2016). Therefore, the output of electricity generated from sunlight reduces considerably depending on the location, the weather, and daylight (Rosencranz 2016). Thus, even if these targets are achieved in 2022, the total power generated will be much lower. That would be the best we can hope for. If these targets slip and are not realized on time, as the thermal power capacity is slated to grow substantially, the composition of solar power generation would prove to be even smaller.⁵²

To achieve the target, the government ought to address the above issues with a high degree of urgency. The MNRE should establish a fixed and decisive deadline to achieve its targets in a timely and efficacious manner.

Wind Energy

The government proposed to achieve 60 GW of wind-installed capacity in the 2015 budget and its INDCs. As of May 2016, the cumulative capacity of all wind farms was 26.8 GW, making India the 5th largest wind power producer in the world.⁵³ Wind energy has been the predominant contributor of renewable energy in India, accounting for over 65 per cent of installed renewable capacity.⁵⁴ With a potential of more than 100 GW, India's aim is to achieve 60 GW of installed wind power capacity by 2022.⁵⁵ The potential has been worked out on the basis of availability of areas with high wind speeds. But these too vary substantially over seasons and over years. Wind energy was, until a couple of years ago, the fastest growing renewable energy sector in the country. It seems wise to put a focus on achieving as much as can be achieved by setting up wind farms.

To achieve growth in the wind energy sector, the government aims to incentivize investors by providing a tax depreciation allowance.⁵⁶ An amount equivalent to 80 per cent of tax depreciation is granted during the first year of installation.⁵⁷ This essentially implies that 80 per cent of the installation cost can be added to the income generated by selling wind power.

A major step towards facilitating the growth of wind energy is the approval of the National Offshore Wind Energy Policy, which aims to tap and establish wind farms within India's Exclusive Economic Zone (EEZ).⁵⁸ There is enormous potential for development of offshore wind energy along the 7600 km Indian coastline, thereby replicating the onshore wind power development offshore.⁵⁹ Potential developers will be allocated blocks through a bidding process.⁶⁰ Seabed lease agreements will be executed between the potential developers and the government.⁶¹ The National Institute of Wind Energy (NIWE) or State-owned off-taking companies will then execute power purchase agreements with developers in accordance with the regulations of the Central Electricity Regulatory Commission.⁶²

There are a number of fiscal incentives for offshore wind power projects. Project developers will be entitled to a ten-year tax holiday under the Income Tax Act 1960. There will be exceptions on custom and excise duties for manufacturing and importing equipment. Projects will also be exempt from service tax on third party services relating to resource assessment, environmental impact assessment and oceanographic studies, and the use of survey and installation vessels.⁶³ However, this seems to be an uncertain and expensive proposition. It would be extremely difficult for NIWE, as the principal agency for the development of offshore wind power projects, to attract investment.

Despite this major move towards development of offshore wind power projects, there are issues pertaining to the weak national grid transmission structure. In 2014, the government announced its plans to make a separate corridor for all renewable energy resources, but with the many constraints already discussed, all this seems unlikely to materialize.

Further, wind turbines and mills currently in use have reached the end of their useful life and need replacement.⁶⁴ The old technology has undergone significant improvement through the use of taller towers and lighter blades. These improvements could increase wind energy capacity, but replacement is essential—and, of course, costly.

Wind energy development is further constrained by local challenges such as land acquisition from local landowners, delay in approvals and processes, and disputed power purchase distribution agreements. There is immense competition from solar energy, which is fast growing.⁶⁵ Despite proliferating strongly, installed wind capacity grows at less than half the pace of solar PV, in part due to the wide gap in the cost of solar compared with wind. The costs of solar panels have fallen steeply and there is no such fall in the costs of installing wind turbines. This imposes the largest constraint on investment for wind power generation. The returns are far too small and slow. Despite the huge incentives put forth by the government, investment is likely to falter. Accordingly, India is very likely to witness less than the targeted growth in wind energy.

Bio Fuels

Biomass is the most widely used energy source in India. Seventy per cent of India's population is reliant on biomass—wood and dung—for cooking in rural households, at a great cost to public health.⁶⁶ In the regulated sector, bio-energy constitutes only 4.8 GW, which is less than 1.3 per cent of the total primary energy capacity in the country. Of this, bio-energy from waste (0.118 MW) is a small and insignificant fraction.⁶⁷ India's internal target is to establish an installed capacity of 10 GW of biofuels by 2022.⁶⁸ India's potential to generate energy from biofuels, is not even beginning to be tapped with these meagre targets.

The National Policy on Biofuels has envisaged a target blending of diesel and petrol with up to 20 per cent biofuels (bio-diesel and bio-ethanol). But to achieve this aim and expand the use of biofuels, India is moving slowly. The government plans on blending only 5 per cent of biofuels in diesels that would be consumed by bulk users such as the railways and defence establishments.⁶⁹ Despite being economical for expanding biomass, a major concern is with respect to the implementation of blending.

The government proposes to encourage farmers and landless labourers to plant non-edible oil seeds and plants like *jatropha* to boost the production of bio-diesel and bio-ethanol. The agricultural produce would be procured by public or private processing entities through the government's Minimum Support Price Mechanism.

To expedite the proliferation of bio-diesel and bio-ethanol across the country, the government will enhance the incentives for processing and production activities.⁷⁰ Foreign investment in the sector would also be encouraged.⁷¹

The Motors Vehicles Act already allows 'conversion of an existing engine of a vehicle to use biofuels'.⁷² Engine manufacturers will be required to make the necessary changes to the engines to ensure compatibility with biofuels.⁷³

Very little growth, however, is expected to come from bio-waste. India generates sufficient nutrient-rich sewerage and solid wastes which should be used to generate power.⁷⁴ The few pilot plants that have come up are mired in controversy and large scale generation of power from bio fuels is not now envisaged. The technology exists and the raw material of waste is available in abundance; what remains is to put together the right policies and to create the space for key investors to come in and fuel its growth.⁷⁵

Government Measures to Achieve Targets

Progress in 2016

India is close to achieving its solar capacity additions for 2016. The MNRE has been proactive by approving 15 GW of new solar projects, of which 12 GW of projects commenced operation in 2017.⁷⁶

India is taking steps to deal with the problem of its electricity retailers and an insufficient grid. For instance, an initiative that will be executed by the Powergrid Corporation of India Limited and other state transmission utilities is the Green Energy Corridor (GEC).⁷⁷ Under this initiative, additional transmission system will be set up, thereby allowing renewable energy to be transmitted on the grid. This would also alleviate the issue of power deficit. Many states such as Andhra Pradesh, Rajasthan, and Tamil Nadu have already begun the initiative. Another initiative, the Central Electricity Regulatory Commission ('CERC') has been introduced to prescribe regulations that support and increase transmission capacity.⁷⁸ It also supports more renewable energy on the grid.

The government's UDAY (Ujjwal Discom Yojana) scheme was launched in 2015, which provides lifelines to state-based power

distribution companies.⁷⁹ These state government-owned distribution utilities will be improving their operational efficiencies and at the same time reducing their debt as well as their interest thereon. This scheme will particularly benefit those power distribution companies lacking financial aid due to power theft being committed on a large scale, high costs of power, inadequate operations, and inaccurate billing practices.⁸⁰ However, not all States have signed up for it.

The Solar Energy Corporation of India (SECI) aims to cover matters of different kinds of renewable energy.⁸¹ The intention was to increase direct investment from the public sector, so that more projects could be run by the public sector or in collaboration with private parties. So far the push has been only on private investment, but the country's economy seems to show the right mix between the public and private sectors. The PPP models for developing solar power have not yet been formulated. It is expected that SPCI would bring up innovative routes for promotion of renewable energy.

A new policy for distributed generation has been announced recently by the central government.⁸² This would enable the operation of micro grids, small storage neighbourhoods that can store extra power, and share in limited areas to benefit local users. The policy has just been revealed and the ministries are formulating rules for its implementation.

Other Important Measures

This section highlights the measures taken by the government to achieve its target of 175 GW by 2022. It argues that the measures adopted are insufficient and inefficient, comprising many loopholes. These are as follows:

Coal Cess

The increased coal cess (clean energy cess) is seen as one measure to provide funds in the renewable energy sector. The coal cess, initially introduced at Rs 50 (US 8 cents) per tonne of coal, has increased to Rs 400 per metric tonne.⁸³ The cess, forming the corpus of the National Clean Environment Fund, is being used for financing clean energy technologies and related projects.⁸⁴ The total collection of Rs 170.84 billion

(\$2.7 billion) till 2014–15 is being used for 46 clean energy projects worth Rs 165.11 billion (\$2.6 billion).⁸⁵

Despite the substantial increase, the cess will make solar power marginally more competitive by increasing the cost of coal. The increased costs will eventually be passed on to consumers in the form of higher electricity bills.⁸⁶ Disappointingly, the funds are not being utilized for its renewable energy purpose. Much of the cess collected has been given to the Ministry of Water Resources for the Ganga rejuvenation project. We, therefore, cannot assume that the entire amount collected from the new coal tax will go towards renewable energy.⁸⁷ In any case, the increased cess is still not sufficient to achieve the ambitious goals set by government.

Financial Package for State Debts

The MNRE specifically called upon states to make a significant contribution to meet the steep renewable energy installation.⁸⁸ The government had announced a comprehensive financial package to restructure the debt on state power utilities.⁸⁹ The debt on these utilities will be taken over and guaranteed by the respective states.⁹⁰ These utilities will not be given any additional credit from banks and will have to gradually increase their tariffs and reduce losses.⁹¹ The government failed to consider the massive amount of state-utility debt involved before making its renewable energy commitments.

Role of Private Investors

State-owned institutions such as Power Finance Corp. Ltd and Rural Electrification Corp. Ltd have committed a total of \$300 million to the fund for renewable energy.⁹² However, no progress has taken place to work towards the set target.

Public-Private Partnerships (PPP)

PPPs bring in the technology, expertise, and capital needed to tap into the unrealized potential of renewable energy in India.⁹³ The International Finance Corporation ('IFC'), part of the World Bank, advises government on structuring PPP transactions. It is currently helping the Indian

government establish partnerships to support the quest for a sustainable future (for example, the Gujarat rooftop solar project).

The IFC advised the government to set up a major project by structuring a PPP. Two private sector companies won a 25-year concession for a 2.5 MW solar rooftop project each in Gandhinagar, capital of Gujarat.⁹⁴ Under the agreement, the companies installed solar panels on the rooftops of public buildings and private residences and connected them to the grid, and many people are expected to benefit from increased access to power.⁹⁵ The IFC is advising on the replication of this successful pilot in five other cities in Gujarat.⁹⁶ This method is also going to generate renewable energy over a larger period of time and not immediately.

Slow Auctions

Private parties play an important role in setting up solar and wind projects. The government awards tenders primarily through a reverse auction mechanism.⁹⁷ However, such auctions were announced as recently as in 2016, leaving no time to actually allow parties to start their projects given the oncoming deadline.⁹⁸

Two Major Renewable-Energy Related Policies

The Strategic Plan for New and Renewable Energy, which provides a broad framework, and the National Solar Mission, which sets capacity targets on solar renewables.⁹⁹ The government has auctioned many projects under the 'National Solar Mission'.¹⁰⁰ The government now plans to raise the capital needed for renewable energy through auctioning several solar projects ('ultra-mega solar projects'), which are to be set out across States. The government has increased the solar ambition of its National Solar Mission from 20 to 100 GW installed capacity by 2022, a five-time increase and over 17 times more solar than it currently has installed.¹⁰¹ To this end, the government also announced its intention to bring solar power to every home by 2019 and intends to invest in 25 solar parks, which have the potential to increase India's total installed solar capacity almost tenfold.¹⁰²

Solar Mission

The original Solar Mission 2008 targets for 2017 were 27.3 GW wind, 4 GW solar, 5 GW biomass, and 5 GW other renewables. For 2022,

the targets were to increase to 20 GW solar, 7.3 GW biomass, and 6.6 GW other renewables.¹⁰³ Without the aggressive participation of the private sector, any rise of India's renewable energy market will not be possible.¹⁰⁴ This aggressive march towards grid parity has been possible only because of large-scale participation of national and international private sector companies.¹⁰⁵ Some of the companies leading the Indian solar power market include, First Solar, SkyPower Global, ReNew Power, Azure Power, and several others.¹⁰⁶ Previously, only Indian companies were investing in these projects. However, as the targets and volume for projects increased, it has attracted foreign investors as well.

State Auctions

Several States have set up plans and targets with special emphasis given to solar energy. Auctions of State solar projects have also taken place.¹⁰⁷ Delhi is one such State where the activities with regard to solar power are going to increase. Delhi has extreme temperatures and this incentivizes the development and adoption of renewable energy. The weather in Delhi also makes it suitable for generating electricity through solar panels. Delhi's peak power demand is 6.5 GW a day.¹⁰⁸ Delhi Chief Minister Arvind Kejriwal has stated that, 'Making Delhi a solar city is on our 70-point agenda'.¹⁰⁹ For this purpose, the target set by the State is higher than any other State. It has set a target of generating 1 GWhr of solar power a day through rooftop installations by 2020 and 2 GWhr by 2025.¹¹⁰

International Relations with US

One more measure that was taken to help achieve India's targets was the signing of the Partnership to Advance Clean Energy (PACE) in 2009 between India and US. US promised to support India's goals of shifting to renewable energy completely. The main goal of the policy is to accelerate inclusive, low carbon growth by supporting research and deployment of clean energy technologies.¹¹¹ This was further strengthened by joint agreement between President Obama and Prime Minister Narendra Modi in January 2015,¹¹² but has not yet been supported by any visible action. There has not been any sufficient assistance to achieve the 2022 ambitious goal, or any noticeable increase in US funding for PACE.

Policies for the High Investment

The ambitious goal of achieving 100 GW that the Indian Government has set would require a high investment of at least Rs 6 Lakh Crore (\$100 billion).¹¹³ Energy Minister Piyush Goyal has said, 'we are working on a policy to promote large-scale domestic manufacturing of solar equipment for making it more competitive'.¹¹⁴ Minister Goyal further added that, 'We are trying to bring in a policy wherein we are thinking what support we can [obtain] for large-scale production of equipment like silicon wafers. A policy in this regard is being considered which will be put up for Cabinet approval soon for a quantum jump in domestic production of solar equipment'.¹¹⁵

While the government is moving in the right direction by identifying the needs and the investment required, it is being unusually aggressive and perhaps delusional by stating that policies and targets have almost been achieved. As noted earlier, Minister Goyal stated that the 100 GW target of installed capacity of solar energy could be achieved by 2017 itself.¹¹⁶ He also said that India has the potential to have 750 GW of solar power generation capacity; domestic as well foreign players would have ample opportunities.¹¹⁷ We are not even close to the target as of now. Government's ambitious goals may attract some investors in the near-term, but we may lose out on future investments. The minister stated that the Department of Industrial Policy and Promotion has laid down certain policies and they are being evaluated for the future.

Adjusting the Tariffs

The government also has to adjust the tariff when foreign investors come in. The Central Electricity Regulatory Commission (CERC) promotes foreign investment by increasing tariffs. They need an open, transparent, and effective regulation system and determination of tariffs (which is critical, as this would directly impact the revenues of investors).¹¹⁸ Accordingly, CERC has announced certain guidelines and key steps to be taken to help achieve the foreign investment target.

Government's Viewpoint

The government has continued to assert at all international meetings that the 175 GW target is achievable. Recently, even at the Solar Thermal

Technology and Solar Cooker Excellence awards, Goyal stated that the targets are realistic. He said that India exceeded its 2016 fiscal year (FY) solar targets by 116 per cent, and that the country 'has signaled to the world that we're ready to lead'.¹¹⁹ India will make new plans yearly to achieve its goals.

India may have a suitable climate for the development of solar energy, but the government continuously fails to take into consideration the huge investments required. As per the yearly targets of the government, India aims to add 12 GW of new solar power capacity this fiscal year, and add 32 GW and 48 GW of new solar capacity in FY2018 and FY2019, respectively.¹²⁰ The current targets are not close to being achieved as it has reached only 5.8 GW which is not even half of the intended. Certain areas in India do not have sufficient amount of sunlight needed to set up solar panels; this will force the government to shift to other modes of renewable energy to achieve its goals. Careful planning and investment is required to give India a hope of leading in renewable energy.

The targets for 2016 have still not been achieved; to keep up this trend the state must put in greater efforts in the years to come. This will impact national energy climate change commitments as well as solar commitments.

The Indian subcontinent has been actively promoting the transmission of solar energy onto the grid. Nonetheless, it now needs to pay heed to the ever-increasing demand for solar power.¹²¹ This can be achieved by taking steps to ensure the private sector gains access to affordable solar energy. Storage technologies and distributed and off-grid generation systems are essential to achieve India's future solar commitments.¹²²

Renewable Targets Being Too Ambitious: Not Achievable

As already indicated, the renewable targets seem too ambitious to actually be achieved. Solar, for example, which is one of the most promising among the renewable technologies, is beset with unrealistically high targets. This is evidenced by the fact that the government raised its solar target from 20 GW (pre-Paris) to 100 GW by 2022. Given that India's output levels are between 3–4 GW, meeting the 100 GW target will require more than a 50 per cent compound annual growth rate for the

next few years.¹²³ This leap seems even more fictional and far-fetched in the context of the fact that Germany, which is the world leader in installed solar, has only targeted 66 GW by 2030.¹²⁴ If the German statistical data is to be believed, India's 100 GW goal seems like a figment of her imagination. The fact that India has the advantage of being closer to the equator thereby making it more potent to tap solar resources does not do enough to justify such a huge difference between the two countries.

There are several other factors which go into making a particular country a favourable destination for production of solar energy, financing capital projects being a major one. Evidently, India has suffered in this field. In spite of foreign companies pledging over double the 100 GW goal, foreign investors may still be reluctant to proceed with financing these projects given the high rate of stalled infrastructure projects. Risks including but not limited to market, credit, and counterparty risk result in increased costs and uncertainty, thereby making it difficult for solar to compete with coal, even with declining solar costs. Having said this, India will surely increase its renewable energy capacity by 2022; but the targets of 100 GW of solar and 175 GW of total renewables in a bid to lead the world are unrealistic.¹²⁵

Other countries have gone ahead and set realistic goals, which they can achieve within their stipulated time. India should attract foreign investment by setting ambitious goals and seeming to be determined about achieving them. A competitive cycle could emerge where foreign players compete for a piece of the Indian renewable sector.¹²⁶ However, if the financing climate does not improve and/or adequate policy support does not materialize, India will be left with massive unfinished projects and a further tarnished foreign investment reputation.¹²⁷

The investment for renewable energy should be simultaneously achieved while producing renewable energy. However, if the amount being invested by companies does not yield expected results, it will cause more harm to future investments. The government has to ensure that it brings about proper legislation that will govern all aspects of renewable energy. It further needs to adapt to other renewable energy, like wind, that is easily available and does not require such high investments. Further, it needs to generate small capital investments for developing renewable projects. The easiest way to meet a big target is to work with a few developers on immense projects—the financing is easier, and

permitting and land acquisition are more tractable for a single project rather than for a multitude.¹²⁸

Further, India's INDCs do not reflect the fact that India plans to triple its usage of coal for thermal power generation, as Coal India Ltd has planned to ramp up its coal output from the current level of about 550 million tonnes to 908 million tonnes by 2020.¹²⁹ Additional end user coal production of nearly 500 million tonnes is planned through recently allotted coal blocks. This obviously leads to the conclusion that India has plans to triple its thermal power capacity. We could expect this to rise so much that it overshadows the enhanced renewable capacity. Further, coal being produced in India has high ash content and the efficiency is extremely low. More coal use is, of course, at odds with the government's renewable energy targets. It remains to be explained by the government how any sizeable impact might be expected on its overall emissions from the push it claims to be making to enhance renewables, when thermal power is already slated to be enhanced to such a large level.

Urgent Measures to be taken by the Government

Implementation of Draft Renewable Energy Act

The draft National Renewable Energy Bill, 2015 ('Bill' or 'Proposed Act'), released on 14 July 2015, is aimed to regulate and promote the use of renewable energy in India.¹³⁰ The Act only covers some aspects of renewable energy in India. To expand its reach, the Act is under amendment and it is hopeful that the Proposed Act will cover all aspects of renewable energy in India. In addition, the Bill aims to address issues that are not adequately covered in the Act, such as principles of grid planning and operation.¹³¹

The Proposed Act aims at producing decentralized energy. This will cut down the cost of transmission to a large extent and also prevent any loss of energy due to transmission. Under the Proposed Act, there will be a committee set up which will be called the 'National Renewable Energy Committee' ('RE Committee') and will implement the National Renewable Energy Policy and National Renewable Energy Plan.¹³² The RE Committee would also enable inter-ministerial coordination and coordinate matters on the integration of renewable energy into the electricity grid.

The Act has also simplified the process for corporations to get a license to supply energy by doing away with the requirement of obtaining a license for renewable energy. The MNRE will be responsible for setting up an accreditation programme for renewable energy manufacturers, system integrators, and others.¹³³ There will be a National Renewable Energy Fund and State Green Fund, which will be run by the Centre and the State respectively to meet the expenses of setting up renewable energy.¹³⁴

The Proposed Act displays a significant change in policy.¹³⁵ It is an extremely important piece of legislation, intended to create an institutional structure with the objective of promoting renewable energy in the country.¹³⁶ It seeks to create a National Renewable Energy Policy to focus on research and development. However, the Act is yet to be passed and still requires changes and amendments.

Use of Geothermal Energy and Concentrated Solar Energy

Geothermal energy is a site specific, green, and reliable source of energy that extracts the steam heat in geologic rock. Unlike solar or wind energy, geothermal energy is not season or weather specific. India has a potential of producing 100 GW of geothermal energy.¹³⁷

In light of the growing need to shift towards green energy, the MNRE has proposed forming the Indian Geothermal Energy Development Framework (Draft) for harnessing geothermal energy in India.¹³⁸ The Draft aims to facilitate development, technological advances, and research in geothermal energy. It aims to develop 1 GW of energy by 2022 and 10 GW by 2030.¹³⁹ However, presently, the Draft has yet to be implemented. A number of Indian Fortune 500 companies have attempted international collaboration to establish geothermal energy in India. However, there has been no actual development of any such projects.

This sector of renewable energy has been largely neglected owing primarily to the cheap availability of coal and lack of experience in the field, making foreign investors reluctant to enter the Indian market.¹⁴⁰ Geothermal energy is expensive. To make it economical, the cost and quality of drills are required to be lowered. One way to address such issues is through international collaborations with various countries such as US that have established expertise in geothermal energy.

Another technology that needs to be fostered quickly is the emerging new area of concentrated heat and power (CHP). Solar panels in parabolic formations concentrate solar just like a magnifying glass does. This is beamed to a central tower in the CHP Array, which uses its heat as well as power.¹⁴¹ Large establishments of CHP have already been pioneered in desert locations in the US. India could take this technology forward by indigenizing it to suit its own needs. A focus area of research in such technologies needs to be created so that India comes up with its own novel methods, innovations, and inventions. Schemes should be created to develop these alternatives for the future.

Involvement of Indian People

One of the reasons the shift to renewables is not taking place at an accelerated pace is that Indian people are not involved; it seems like someone else's target. Rooftop solar photovoltaic has been recently enabled by the regulatory bodies and this can take off when people want to invest a bit of time, money, and energy to install solar panels on their rooftops. Solar water heaters are already widespread and work well on Indian roofs. Awareness of the new technology, benefits offered by the local governments as incentives with a drive to use natural energy, reduce pollution, achieve self-sufficiency, and conserve fossil fuels can be achieved just the way awareness of a clean India is being achieved through Swachh Bharat.

To augment India's funding needs for this switch, inviting foreign investments is already being practiced, but innovative schemes need to be created to inspire higher domestic investments.

India has an exceptionally high rate of savings. If the nation were to call upon people to invest in new government energy schemes, buy government energy bonds, as well as take part in crowd funding, and if the right awareness were to be created of the nation's polluted and health-damaging environment, the response might be surprising.

The choices faced by India need to be judiciously exercised and the nation needs to arrive at its real prerogatives. It appears that populist sentiment plus pressures in negotiations with the US might have nudged

India into declaring its INDCs, the most critical parts of which India has chosen to offer in relative terms. There is no specific quantified carbon capping, halting, or reduction committed.

It will take India a massive dose of investment in transmission and distribution infrastructure, apart from just making arrangements to generate more renewable energy. There is no evidence so far of a plan for what the nation needs to do to achieve these commitments. These should have obviously been planned before committing the INDCs.

India's bold internal goals of taking renewables up to 175 GW by 2020 are quantified but these do not contain any greenhouse gas reduction or low carbon commitment. Further, these goals are already slipping to 2022 and are likely to slip further.

Our analysis above indicates that coal output, on the other hand, is planned to triple from the present 550 million tonnes to about 1.5 billion, to feed the planned growth of energy demand in the country.¹⁴² There is no license required to setup thermal or any other power generation plant.¹⁴³ Import of coal continues to be duty free and over 140 million tonnes were imported last year. Being cheap, due to a depressed international coal market, the import of coal is likely to grow, despite substantial growth in internal output. Compressed natural gas (CNG) terminals are in place with a substantial network of pipelines to import more gas. India has begun importing large amounts of CNG.

There is no evidence of financial means to achieve the INDCs, as against the need of trillions of dollars of investments required to achieve these. All that can be seen is a small loan of \$1 billion recently committed by the World Bank. This is too little to achieve these grand goals. India has watered down its earlier stand of insisting on western funding for the switch to renewables.

Concern about breathing polluted air is missing in popular Indian sentiment. There is little consciousness in the people of this nation to urge the decision makers to make their lives healthier. An implicit internal consensus appears to be in place which supports increasing generation of non-renewable energy. The government therefore seems to be playing to appease international sentiment with a grand show of its much hyped internal and INDC goals, while going ahead behind the scenes with its real plans to generate more from fossil fuels. Unless public opinion in the country becomes alarmed at the threats this poses

to the health of its citizens, India might not manage to swing out of its present energy trajectory.

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SANJAY UPADHYAY

Renewable Energy Development in India

The Need for a Robust Legal Framework

India has come a long way since the Department of Non-Conventional Energy Resources was setup in 1982. The rapid industrialization and urbanization, the fast-depleting conventional energy sources, the concerns on environment and clean technology, and most recently, the visible impacts of climate change makes a strong case for providing a robust legal framework for promoting renewable energy (RE). Clearly, the need for developing RE to compliment conventional energy sources cannot be overemphasized in this rapid changing global climate. The advantages of RE sources as indigenous, non-polluting and virtually inexhaustible resources, especially in this uncertainty of global climate change make a fit case for promoting RE. It also provides national energy security at a time when decreasing global reserves of fossil fuels threatens the long-term sustainability of the Indian economy. The energy security is an issue not only at the national level, but also at the local level. A major part of rural India still suffers from inadequate supply of electricity in particular and other energy sources for other basic needs. India has a vast supply of RE resources, and thus is also a major energy producer and consumer. It is the eleventh largest economy in the world and is poised to make