REGULATORY FRAMEWORK FOR INVESTMENTS IN RENEWABLE ENERGY IN INDIA WITH SPECIAL REFERENCE TO THE ELECTRICITY ACT 2003: A CRITICAL ANALYSIS

A thesis submitted to the

University of Petroleum and Energy Studies

For the Award of

Doctor of Philosophy

in

Law

BY

Sujith P. Surendran

May 2020

SUPERVISOR

Prof. (Dr.) Tabrez Ahmad

UNIVERSITY WITH A PURPOSE

School of Law

University of Petroleum and Energy Studies

Dehradun – 248007: Uttarakhand

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DECLARATION

I declare that the thesis entitled **"Regulatory Framework for Investments in Renewable Energy in India with Special Reference to the Electricity Act 2003: A Critical Analysis"** has been prepared by me under the guidance of Prof. (Dr.) Tabrez Ahmad, Pro Vice Chancellor and Dean, School of Law, G D Goenka University, Sohna, Haryana, India. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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Referee, Journal of IPR, CSIR, ISSN: 0975-1076
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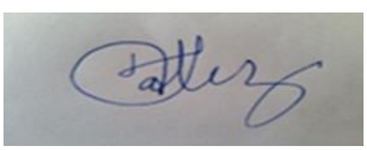
Date: 02/06/2020

CERTIFICATE

I certify that Sujith P Surendran has prepared his thesis entitled "Regulatory Framework For Investments In Renewable Energy In India With Special Reference To The Electricity Act 2003: A Critical Analysis", for the award of PhD degree of the University of Petroleum & Energy Studies, under my guidance. He/she has carried out the work at the School of Law, University of Petroleum & Energy Studies.

Guide



Prof. (Dr.) TABREZ AHMAD

ABSTRACT

REGULATORY FRAMEWORK FOR INVESTMENTS IN RENEWABLE ENERGY IN INDIA WITH SPECIAL REFERENCE TO THE ELECTRICITY ACT 2003: A CRITICAL ANALYSIS

There are many renewable energy sources. Some sources are used to produce bio-fuels while some are used to create electricity. This study focuses on renewable electricity. Renewable Electricity in India is produced mainly from wind and solar. Wind energy do not have a nationwide potential for generation. The states like Tamil Nadu, which has high wind energy potential has already adopted measures for the promotion of the same. Solar Energy on the other hand is available across all states.

Considering the universal nature of solar energy and the potential to be the future of our energy resources, the research is focused on solar energy investment and the regulatory framework dealing with solar in India. The thesis chapters are arranged for discussion of various aspects of the enquiry and addressing various research questions in the following manner.

CHAPTER 1: INTRODUCTION

Introduction to the Thesis. The chapter sets out the research problem, hypothesis, and literature review.

CHAPTER 2: REVIEW OF LITERATURE

A detailed review of literature has helped to identify the research gap. Many researchers have approached the law for renewable energy as a piece of legislation to fix a favorable tariff and to enable competition in the market. To achieve an optimum level of renewable energy generation, the potential capacity needs to be exploited by an optimum investment in the sector. There are various barriers to for investors which can be addressed by a comprehensive legislation to promote renewable energy.

CHAPTER 3: ACCESS TO ENERGY AND THE ELECTRICITY ACT 2003

This chapter examines the constitutional background of the Electricity Act 2003. The chapter will explore the fundamental rights concerning various essential amenities of life, the constitutional mandate under the Directive Principles of State Policy and the center- state relations concerning the division of various legislative powers. After analyzing the constitutional background, the chapter will try to explore the competing claims where the state is under obligation to provide clean and cheaper energy with the sustainability attributes and also ensure equitable distribution of the resources of the nation. The chapter also examines how the Electricity Act 2003 can meet the demand for energy by ensuring an adequate supply of energy throughout the year and also for future generations. According to neo-classical economic theories, the optimum utilization of resources is possible only by bringing competition to the market. Competition in the market is possible only when there are private players in the market. Private players will be interested in investments in the electricity sector only if there is a level playing field with already existing government players and the sector is profitable. This chapter thus examines the attractiveness of the sector under the current regulation under the Electricity Act 2003.

The objective of the chapter is to identify various advantages and shortcomings from a legal perspective in the existing regulations under the Electricity Act 2003. This chapter examines the constitutional provisions and various court judgments regarding electricity, access to electricity, and the division of legislative power between the states and center. It details the regulatory mechanism for electricity.

CHAPTER 4: LEGISLATIONS COMPLEMENTING THE GROWTH OF THE SECTOR

The growth of renewable energy sector depends on various other legislation in addition to the Electricity Act 2003. This chapter will explore the business environment in India based on the ease of doing parameters adopted by the World Bank. These other legislations, regulations and policies have a direct or indirect impact on the promotion and development of renewable energy sector. The first part of this chapter analyses the general business environment in India which will impact any business activity including the renewable energy sector. The second part of this chapter will examine how the central state government policies and measures have helped the renewable energy sector, especially solar.

CHAPTER 5: BARRIERS TO RENEWABLE ENERGY DEVELOPMENT

India has adopted a comprehensive approach to energy security which is set out in the proposed energy policy. The policy is ambitious of achieving the huge energy targets in the future through the proposed energy mix. The proposed energy mix envisages to have a major role to be played buy the renewable energy technologies. But there are various barriers to be removed for the government to achieve the ambitious energy targets. The barriers to development of RE in India, in general, are described in this chapter. A careful review of existing literature by eminent scholars in the area have identified various barriers to renewable energy development. The scholars have adopted various methods of study to identify various barriers. This chapter is an enquiry into various such barriers. Some of these may be specific to a technology, while some may be specific to a policy, site or a region.

CHAPTER 6: THE STRUCTURAL ANALYSIS OF THE RENEWABLE ELECTRICITY SECTOR AND INVESTMENT DECISION

The investment decision situation is broken into its elements using a framework developed with inspiration from the Institutional Analysis and Development framework. The elements are identified and the key actors, the investors are approached for a survey through questionnaire. The survey has helped to identify the main detractors and the main promoting measures for renewable energy.

The method of study is inspired from various frameworks suggested by various authors including the Institutional Analysis and Development framework developed by Nobel Laureate late Dr. Elinor Ostrom. According to the framework used in the study, the action situation is deconstructed into various elements influencing the decision making. Here the investment decision by a developer is considered for the study.The framework is used to identify all the factors which are having an impact on the investment decision and to understand those factors which can be modified through formal law. The factors which affects the decision can be broadly classified as those which can be changed by rules and those which cannot be changed by rules. The researcher propose to identify the intensity and impact of a factor on the decision making process and propose changes through formal rules.

CHAPTER 7: THE CONCLUSION

The research questions are answered and the Hypothesis is tested. Conclusions and suggestions from the research are set out with further area for future research.

There are many factors which are influencing an investment decision. But the average of the responses clearly suggest that it is the economic and financial concerns which are the determinant of all the investment decision making. Though this looks obvious to any prudent man, the survey has helped to rank various financial factors and non-financial which are impacting the investment decision. The factors which are positively impacting the investment decision include the consideration of reduced electricity bills as the primary factor with 4.09 score average, followed by subsidies with 3.51, tax benefits with 3.49, profitability with 3.37. All other factors have an average below 3, suggesting that the respondents do not consider them as a major influencing factor.

Among the negatively influencing, the following factors have a higher impact on the investment decision. Access to debt finance and the cost of the debt fiancé and the strict regulation for the credit worthiness, and the lack of understanding of the banking officials about the valuation of the project are causing the developers to get financing. Lack of financing with 4.06 average score is the major challenge in investment. Other major detracting factors include lack of multiple buyers with 3.58, lack of consistency of policy with 3.53, lack of government incentives, lack of electricity infrastructure, and lack of single window clearance all the three factors with 3.4 average score, and low profit margin with 3.22 average score has been identified as major detractors. Other factors have an average score less than three.

The study has revealed that India lacks an optimal legal framework to promote investments in renewable energy sector. It is also understood that there is lack of coordination between the ministries, its agencies and state governments. Hence the hypothesis is proved.

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Sujith P Surendran

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AC	Air Conditioners
ACS	Average Cost of Supply
AD	Accelerated Depreciation
BAU	Business as Usual
BCM	Billion Cubic Meters
BEE	Bureau of Energy Efficiency
CAGR	Compounded Annual Growth Rate
CBET	Cross Border Electricity Trade
CBM	Coal Bed Methane
CCS	Carbon Capture and Storage
CEA	Central Electricity Authority
CGD	City Gas Distribution
CIL	Coal India Limited
CMPDI	Central Mine Planning and Design Institute
CO2	Carbon Dioxide
CSP	Concentrated Solar Power
CTL	Coal to Liquid
CTO	Chief Technical Officer
DBT	Direct Benefit Transfer
DBT-L	Direct Benefit Transfer – Liquefied Petroleum Gas
DDG	Decentralized Distributed Generation
DDUGJY	Deen Dayal Upadhyaya Grameen Jyoti Yojana
DELP	Domestic Efficient Lighting Programme
DME	Dimethyl Ether
DSR	Demand Side Reduction
DST	Department of Science and Technology
E&P	Exploration and Production
EESL	Energy Efficiency Services Limited
ESCO	Energy Service Company
EV	Electric Vehicles

FBR	Fast Breeder Reactor
FSA	Fuel Supply Agreement
GAIL	Gas Authority of India Limited
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GSI	Geological Survey of India
HDI	Human Development Index
HDV	Heavy Duty Vehicle
HELE	High Efficiency Low Emission
HRD	Human Resource Development
IAEA	International Atomic Energy Agency
IBM	Indian Bureau of Mines
IEA	International Energy Agency
IESS	India Energy Security Scenarios
IGCC	Integrated Gas Combined Cycle
IREDA	Indian Renewable Energy Development Agency Limited
Kgoe	Kilogram of Oil Equivalent
kWh	Kilo Watt Hours
LCOE	Levelized Cost of Electricity
LDV	Light Duty Vehicle
LED	Light Emitting Diode
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LWR	Light Water Reactor
Mboe	Million Barrel of Oil Equivalent
MDO	Mine Developer cum Operator
MoEF&CC	Ministry of Environment, Forests and Climate Change
MoPNG	Ministry of Petroleum and Natural Gas
MoSPI	Ministry of Statistics and Program Implementation
Mtce	Million Tons of Coal Equivalent
Mtoe	Million Tons of Oil Equivalent
MW	Mega Watts
MNRE	Ministry of New and Renewable Energy

NAPCC	National Action Plan on Climate Change
NDCs	Nationally Determining Contributions
NELP	New Exploration Licensing Policy
NEP	National Energy Policy
NGO	Non-Governmental Organization
NISE	National Institute of Solar Energy
NIWE	National Institute of Wind Energy
NMCC	National Mission on Clean Cooking
NMEEE	National Mission on Enhanced Energy Agency
NMT	Non-motorized transport
NOC	National Oil Company
NPCIL	Nuclear Power Corporation of Indian Ltd.
NRDC	National Research Development Corporation
NSS	National Sample Survey
NTPC	National Thermal Power Corporation
OALP	Open Acreage Licensing Policy
OECD	Organization for Economic Cooperation and Development
OIDB	Oil Industry Development Board
OMC	Oil Marketing Companies
ONGC	Oil and Natural Gas Corporation
PAT	Perform, Achieve and Trade
PCRA	Petroleum Conservation Research Association
PGCIL	Power Grid Corporation of India
PHWR	Pressurized Heavy Water Reactor
PLF	Plant Load Factor
PMUY	Prime Minister Ujjwala Yojana
PNG	Piped Natural Gas
PNGRB	Petroleum and Natural Gas Regulatory Board
PPA	Power Purchase Agreements
PPP	Public Private Partnership
PSU	Public Sector Undertaking
PWD	Public Works Department
R&D	Research and Development

R&R	Resettlement & Rehabilitation
RE	Renewable Energy
RESCO	Renewable Energy Service Company
RPO	Renewable Purchase Obligation
SAARC	South Asian Association for Regional Cooperation
SDA	State Nodal Agency
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commission
SUVs	Sport Utility Vehicles
T&D	Transmission and Distribution
TEC	Telecommunication Engineering Centre
TWh	Terwatt Hour
UDAY	Ujwal Discom Assurance Yojana
ULB	Urban Local Bodies
UMPP	Ultra Mega Power Project
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
VGF	Viability Gap Funding

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R.Santhana Raj vs The Chief Engineer

Transmission Corporation of Andhra Pradesh Ltd. and Anr. v. Sai Renewable Power Pvt. Ltd. and Ors.

CHAPTER - 1

INTRODUCTION

1.1 INTRODUCTION

More than six billion of the 7.3 billion inhabitants on earth today are living in the less developed regions of the world[1]. People from the developed nations enjoy the fruits of development and lead quality life compared to their counterparts in less developed regions[2]. The less developed nations thrive to perform in the economic arena with increased investment in industrial and trade activities. Better economic conditions are inevitable for them to eradicate poverty and increase life expectancy. The economic performance of a country is greately influenced and depended on the availability of energy resources[3].

The major share of the energy produced and consumed today is from fossil fuels. Coal, Oil and Gas occupy a key position in the global energy mix. Almost 85% of today's commercial energy need is met by them[4]. There is a higher energy demand from developing nations when they embrace development and progress in that trajectory. The energy which these nations largely depend is fossil fuels. This will not only accelerate the depletion of such fuels, but also result in the generation of greenhouse gases at unprecedented levels. The global warming is also a major concern of this

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1 IGOR RIBEIRO, KEY FINDINGS WPP 2015 (2015), https://esa.un.org/unpd/wpp/ Publications /Files/Key_Findings_WPP_2015.pdf (last visited Jul 22, 2018)

2 U.N.D.P., 2015 HUMAN DEVELOPMENT REPORT, http://report.hdr.undp.org/ (last visited Jul 22, 2018)

3 David I. Stern, *The Role of Energy in Economic Growth*, (Crawford School Centre for Climate Economics & Policy Paper No. 3.10, 2011) http://ccep.anu.edu.au/data/2010/pdf/ wpaper/CCEP-3-10.pdf (last visited Jul 22, 2018)

4 INTERNATIONAL ENERGY AGENCY, KEY WORLD ENERGY STATISTICS 2015 (2015), https://www.iea.org/ publications/freepublications/publication/KeyWorld_Statistics_2015.pdf (last visited Jul 22, 2018)

scenario. Thus it is important that the world energy production and consumption move towards a more sustainable energy systems and consumption patterns.

The global warming and the depleting fossil fuel resources have made us to think about sustainable energy. Maintaining economic growth and achieving sustainability are conflicting claims at times. Economic growth depends to a large extent on the availability of cheaper sources of energy. Currently the cheaper sources of energy are fossil fuels. Fossil fuels cannot meet the sustainability standards. Creating an energy policy and devising an energy mix is a challenging exercise in this context. Yet, the New Energy Policy 2017[5] is making an attempt to meet all standards and demands to secure India's energy future. There are various factors affecting an energy policy decision. Availability and cost of resources, geopolitical situations, international commitments and the objectives to be achieved are some of the determining factors. The energy policy and energy mix of the countries vary accordingly. For example, India has more thermal power plants while France has most of its electricity produced from nuclear plants and Scotland from wind farms.

1.2 THE NEED FOR THE STUDY

If the world population doesn't make a shift to sustainable energy systems[6], the resultant climate and environmental challenges and the future energy security challenges can lead to deteriorate the conditions for sustaining life on earth. Any attempt to mitigate the greater risks will still leave us short of achieving economic and development goals. It is thus imperative to aggressively plan our future with attaining sustainable development goals. The goal seven of the UN Sustainable Development Goals focuses on Energy[7].

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5 DRAFT NATIONAL ENERGY POLICY NITI AAYOG, GOVERNMENT OF INDIA, https://niti.gov.in/writereaddata/files/new_initiatives/NEP-ID_27.06.2017.pdf (last visited Dec 6, 2018).

6 A 'Sustainable Energy System' is where the sustainable energy is produced and consumed efficiently. See Sujith Surendran & Tabrez Ahmad, *The Need for a Legal Definition of Sustainable Energy for a Sustainable Future*, 2016 1–14, (2016) at 14.

7 THE GENERAL ASSEMBLY & THE GOALS, UN RESOLUTION 2020 AGENDA FOR SUSTAINABLE DEVELOPMENT 2015.09.25, 16301 1–35 (2015).

Across the government and international agencies there has been a consensus that the climate change is real and they have to act immediately to protect the earth from the future devastating destructions the climate change can bring. This consensus can be seen in the new Paris agreement on Climate Change and the creation of International Solar Alliance[8]. Governments need to plan and make investments for the future energy needs as well as a complete shift of current energy sources to clean technology is also inevitable. This task is so huge and the investment requirements cannot be met by the governments and government agencies alone. Private energy investors at small and large scale, micro and macro scale are required to mobilize their resources to achieve the energy goals of the world. Private entities like Microsoft and Facebook are also leading the investment drive in clean energy[9].

Since government resources are limited, it is crucial to attract more private investments to fund the shifting to clean technologies. We need to ensure a legal framework that can attract more investments in the clean energy technologies, including the technologies in the energy production, consumption transmission. This research is primarily focused on examining the existing laws that regulate the investment and doing business in the renewable energy sector with focus on solar energy being on source of energy available throughout the country.

1.3 PRESENT ENERGY SCENARIO

Energy is one of the forces that will shape the world of tomorrow. The way we generate and consume energy will have a profound effect on the living conditions as well as on environment. Identifying the forces which shape our

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[8] MINISTRY OF NEW AND RENEWABLE ENERGY, INTERNATIONAL SOLAR ALLIANCE WILL BE THE FIRST INTERNATIONAL AND INTER-GOVERNMENTAL ORGANISATION OF 121 COUNTRIES TO HAVE HEADQUARTERS IN INDIA WITH UNITED NATIONS AS STRATEGIC PARTNER (Jan 25. 2016), http://pib.nic.in/newsite/ PrintRelease.aspx?relid=135794 (last visited Dec 14, 2018).

[9] Mark Zuckerberg, *Priscilla and I are joining Bill Gates in launching the Breakthrough Energy Coalition to invest in new clean energy technologies*, FACEBOOK (NOV. 29, 2015) https://www.facebook.com/photo.php?fbid=10102500936699601&set=a.52923770 6231.2034669.4&type=3&theater (last visited Dec 14, 2018).

energy scenarios of the future is crucial to control and manage those forces. Only then we may drive our energy future through the path we decide. We need to identify the present scenario and the forces involved as well as the future scenario.

1.3.1 GLOBAL ENERGY SCENARIO

Global Energy Scenario is the reflection of how the energy is produced and consumed across the nations. The global energy scenario is the sum total of energy demand, energy supply, energy consumption and energy mix that each nation is currently dealing with. There are drastic differences in the energy demand, energy supply, energy consumption and energy mix in a developed nation from that of a developing nation. Due to this difference it is logical to consider the details of the current energy scenarios in the developed nation and developing nations separately.

1.3.1.1 World Energy Supply

In the year 2016 the world Total Primary Energy Supply (TPES) was 13761 Metric Ton Equivalent of Oil (Mtoe). 31.9 percentage of the total energy supply came from oil[10]. Coal contributed 27.1 percent, Natural gas 22.1%, nuclear 4.9 %, hydro 2.5 %, biofuels and reached 9.8 % and others 1.7 % [11]. The 1.7 % of energy supply from other sources include geothermal, solar, wind, tidal wave, heat and others. More than 80% of the world primary energy supply is from fossil fuels. The contribution of renewable energy is less than to percentage. Compared to 1973, the share of oil and natural gas has increased in the total energy mix whereas, the oil share has reduced from 46.2 percent to 31.9 percent[12]. The total energy supply has increased from 6101 Mtoe in the year 1973 to 13761 Mtoe in 2016[13].

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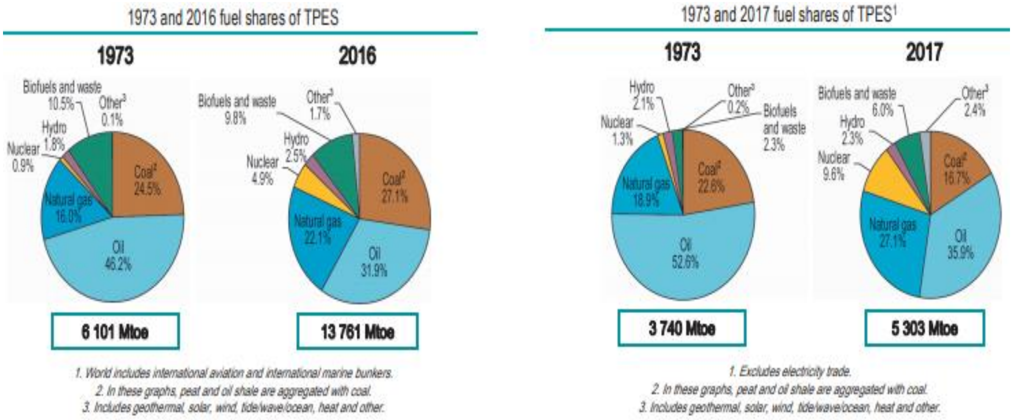
[10] INTERNATIONAL ENERGY AGENCY, KEY WORLD ENERGY STATISTICS 2018, www.iea.org/statistics/. (last visited Dec 15, 2018).

[11] *Id.*

[12] *Id.*

[13] *Id.*



Source: World Energy Statistics 2018

Fig. 1.1 World and OECD Total Primary Energy Supply

It was in 1973 International Energy agency started the Global statistics on energy production and consumption. This was the result of the major oil shock in the 1970s. The international community recognised the need for developing alternative energy sources after the energy stock of 1970s. This is result today commencement of research and innovation in Renewable Energy Technologies which national governments thought can be produced independent of fossil fuels[14].

In the OECD Countries, the total primary energy supply is 5303 Mtoe in the year 2017. It was 3740 Mtoe in 1973. While 52.6% of the primary energy supply came from oil in 1973, the share of oil is 35.9 percent in 2017. The share of renewables is just 2.4 % in 2017. It was 0.2 percentage in 1973[15].

The crude oil production has increased from 2869 Mt in 1973 to 4365 Mt in 2017, with major share coming from Middle East, OECD and Europe. The natural gas production in 2017 was 3768 BCM compared to 1973 when it was 1224 BCM. The coal production stood at 7549 Metric Ton (Mt) which was 3074 Mt 1973[16].

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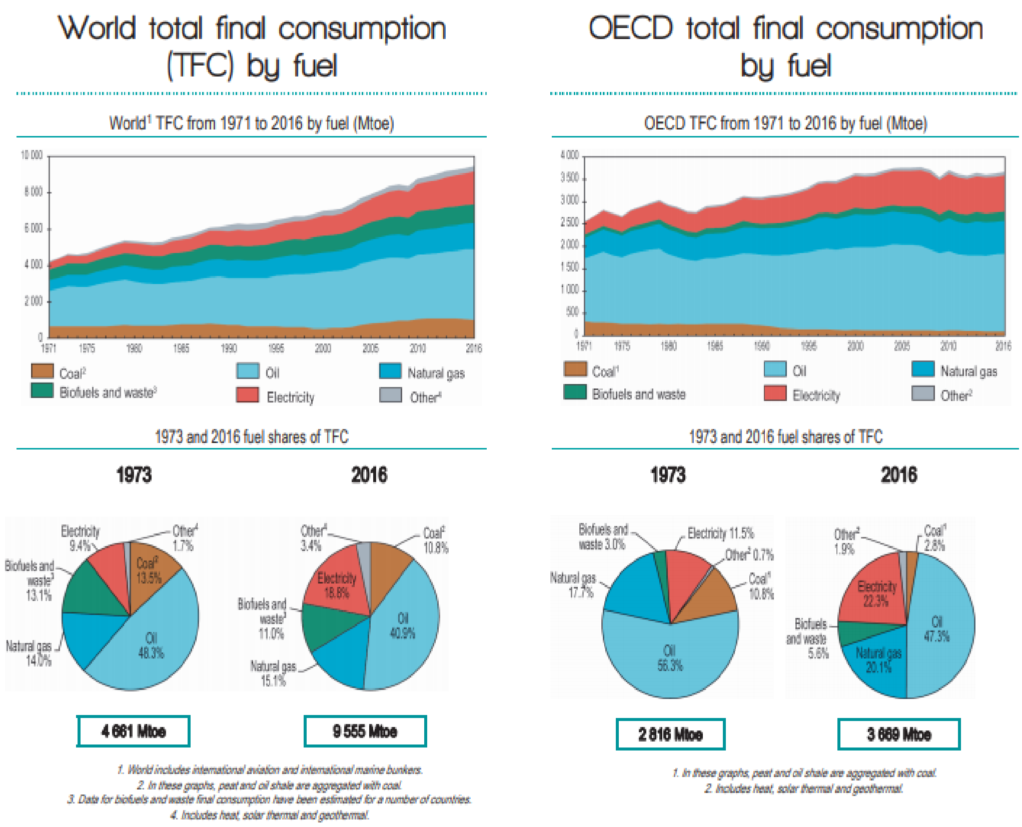
[14] INTERNATIONAL RENEWABLE ENERGY AGENCY, RENEWABLE ENERGY STATISTICS 2018, http://www.irena.org/publications/2018/Jul/Renewable-Energy-Statistics-2018 (last visited Aug 29, 2018).

[15] *supra* note 10 ENERGY AGENCY.

[16] *Id.*

1.3.1.2 World Energy Consumption

The world total consumption of energy is 9555 Mtoe, of which 40.9 percentage is oil. The sheriff natural gas is 15.1 percentage, coal 10.8 percentage, natural gas 15.1 percentage biofuels and waste to energy 11.0 Percentage and electricity 18.8 percentage[17]. OECD countries consume 3669 Mtoe of energy, which is 38.3 percentage of the total energy consumed in the world China consumes 20.7 percentage of the total energy[18]. The non OECD Asian countries including India consumes 13.2 percentage of the Global energy consumption[19].



Source: World Energy Statistics 2018

Fig. 1.2 World and OECD Energy Consumption by Fuel

The hydro electricity production was increased to 4170 Terawatt Hour (TWh) From 1296 TWh in the same period. The renewable energy statistics are

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17 *Id.*

18 *Id.*

19 *Id.*

available from 2005 onwards[20]. In 2005 the total wind energy produced was 104TWh. This is increased to 958 TWh in 2016[21].

The share of oecd countries were 90.2 % in 2005 which is reduced to 63.1 percentage in 2016 due to increased capacity addition in wind energy by China claiming 24.8 Percentage share in the total wind energy production[22]. The contribution of solar photovoltaic electricity to the Global energy mix in 2005 was 4 TWh. This is increased to 328 TWh in 2016. The total Global Electricity production is at 24973 TWh in 2016. In 1973 the Global Electricity production was 6131 TWh[23].

1.3.2 ENERGY SCENARIO IN INDIA

The Compound Annual Growth Rate (CAGR) of Coal & Lignite production in 2016-17 are 3.79% & 2.9% respectively and the consumption was increased by 5.29% and 2.22% respectively for the period[24] during the past decade. Crude Oil and Natural Gas, the Production increased by 0.54% and (-) 0.16% but consumption grew by 4.63% & (-) 2.47% in the period of 2007-08 to 2016-17[25].

Generation of Electricity enhanced by 4.05 % with a consumption increase of 7.82% in the decade ending 2016-17[26]. The period 2007-08 to 2016-17, the Natural gas and Crude Oil has witnessed an increase in imports by 15.42% and 5.46%[27]. Electricity import from Nepal and Bhutan also increased to 7.11% and we also exported with an increase of 30.29%[28]. Industrial sector which is an energy intensive sector consumes 58 % of the total energy consumed

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[20] *Id.*

[21] *Id.*

[22] *Id.*

[23] *Id.*

[24] ENERGY STATISTICS 2018 (TWENTY FIFTH ISSUE) CENTRAL STATISTICS OFFICE MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION GOVERNMENT OF INDIA NEW DELHI, http://mospi.nic.in/ sites/default/files/publication _reports/Energy_Statistics_2018.pdf (last visited Dec 15, 2018).

[25] *Id.*

[26] *Id.*

[27] *Id.*

[28] *Id.*

during the period. The per capita energy use also increased with A CAGR of 3.54% [29].

Coal deposits are mainly found in the states of Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra constituting 98.20% of the coal reserves in India. It is estimated have a 315.14 billion tonnes of coal reserves in India. Lignite on the other hand is estimated to be 44.70 billion tonnes as on 31.03.2017[30].

India produced 662.79 million tonne (MTs) of coal in 2016-17 and 45.23 million tonnes of Lignite[31]. The trend of production from 2007-08 to 2016-17, suggest that coal production in India increased from 457.08 MTs during 2007-08 to 662.79 MTs during 2016-17 at a CAGR of 3.79% and Lignite at 2.90% with an increased production from 33.98 MTs in 2007-08 to 45.23 MTs in 2016-17[32]. Crude oil production was 34.12 MTs during 2007-08 which was increased to 36.01 MTs by 2016-17, at a CAGR of 0.54%. The lack of sufficient oil reserves in India is the main reason for the slow growth of this sector. The cumulative growth of natural gas (-) 0.16% and electricity was 4.05%[33]. The highest growth of all the energy sources was that of the electricity.

The crude oil reserves in India is estimated at 604.10 million tonnes (MT) with Western Offshore having 39.60% of share followed by Assam (26.48%)[34]. Natural Gas reserves stood at 1289.81 Billion Cubic Meters (BCM).

It is estimated to have a high potential for renewable energy from wind, solar, biomass, small hydro and cogeneration bagasse. The potential estimated is at 10,01,132 MW with solar power of 649342 MW (64.86%) and wind power

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29 *Id.*

30 *Id.*

31 C.E.A., POWER SECTOR, GOVERNMENT OF INDIA MINISTRY OF POWER CENTRAL ELECTRICITY AUTHORITY NEW DELHI 1–52 (2018), http://www.cea.nic.in/ reports/monthly/executivesummary/2018/exe_summary-05.pdf.

32 *Id.*

33 *Id.*

34 *Id.*

potential of 3,02,251 MW (30.19%) and remaining other sources including Small Hydro[35].

1.3.2.1 Electricity

India Currently has an installed capacity of 346047.57 MW of power generation as on 31 October 2018[36]. The coal fired power plants contribute the highest sharein the sector with 193466.50 MW of installed capacity. The other fossil fuels which contribute to India's power generation are gas with an installed capacity of 25185.38 MW and diesel having an ins8talled capacity of 837.63 MW[37]. The installed capacity of nuclear power plants is 6780 MW, hydro 45487.42 MW and Renewable Energy Sources (RES) 72012.81 MW[38].

Electricity generation capacity addition witnessed a 6.70% growth of 23680 MW from 2015-16 to 2016-17[39]. The highest growth rate was for Other Renewable Sources (ORS) (24.08%) and Thermal Power (3.73%)[40]. The total Installed capacity raised from 1,43,061 MW in 31.3.2008 to 3,26,833 MW as on 31.3.2017, at a CAGR of 8.61%[41].

The thermal power plants constitute 70.83% of the total installed capacity, with an installed capacity of 267129 MW. Other renewable Sources (excluding hydro) has an installed capacity of 58680 MW, and 15.56% share in the total installed capacity. The Hydro and Nuclear energy are 11.81% and 1.80% respectively. Power generated by entities other than electricity utilities are at 13.34% (50,289 MW).

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35 *Id.*

36 CENTRAL ELECTRICITY AUTHORITY EXECUTIVE SUMMARY ON POWER SECTOR GOVERNMENT OF INDIA MINISTRY OF POWER (OCT. 18, 2018). http://www.cea.nic.in/reports/monthly/executivesummary/2018/exe_summary-10.pdf(last visited Dec 15, 2018).

37 *supra* note 31 C.E.A.

38 *Id.*

39 *Id.*

40 *Id.*

41 *Id.*

The total grid connected renewable power was 42849.38MW as on 31.03.2016[42], and increased to 57244.23 MW as on 31.03.2017 with a growth rate of 33.59. Wind power is the major contributor with 56.39%, solar power (21.47%) and Biomass power (14.29%) are the other major renewable energy sources. Tamil Nadu was the leading state in the renewable energy contribution with high installed capacity of wind power in the state which has been overtaken with solar power by Karnataka recently. As on 31.03.2017 Tamil Nadu had grid connected renewable power of 10562.39 MW, Maharashtra 7647.60 MW, and Karnataka 7457.97 MW. Rural electrification is one of the major challenges of the government. A total of 5,92,972 villages were electrified accounting for 99.2% of the total villages in the country.

Coal and Lignite formed the major portion of the total energy consumption with 45.16% of the total consumption during 2016-17. Crude Petroleum with 35.05% and Electricity with 13.11% was followed. The total consumption increased from 28,337petajoules during 2015-16 to 29,279petajoules during 2016-17 marking 3.32% increase in consumption. Per-capita Energy Consumption (PEC) was 19579 Mega Joules in 2011-12 which has increased to 22351 Mega Joules in 2016-17 at an annual growth rate of 1.89%[43].

Energy Intensity is defined as the amount of energy consumed for generating one unit of Gross Domestic Product at constant prices. Per-Capita Energy Consumption and Energy intensity are the indicators for policy formulation in the energy sector. The Energy Intensity decreased from 0.2732 Mega Joules per rupee in 2011-12 to 0.2401 Mega Joules per rupee in 2016-17.

1.3.3 ENERGY DEMAND FORECAST

During the last decade of 2000/01 to 2010/11 the industry sector in India has shown a consistent average growth of 7%. This sector has consumed 45% of the total commercial energy consumed during the period. India has a

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[42] *Supra* note 24.

[43] CENTRAL STATISTICS OFFICE MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION GOVERNMENT OF INDIA, www.mospi.gov.in2017 (last visited Aug 29, 2018).

population of 18% of the total global population but is consuming an energy share of only 5.7%. The energy demand in India has grown 46% since 2000..

The per capita energy consumption of India is much lower than the developed nations. The India Energy Security Scenarios 2047[44], which has created various future energy scenarios and has made a forecast that the energy demand under the least effort scenario in 2047 will be 22140 TWh[45]. The forecast suggests that with determined effort to bring energy efficiency and energy conservation, the demand can be estimated at 18634 TWh from the current demand of 4929TWh (2012)[46]. According to the forecast, the per capita demand also increases from 4053 KWh to 12991 KWh under least effort scenario and to 10934KWh. All these forecasts suggest that there is going to be a huge requirement of capacity addition in the energy sector.

Actual energy consumption in 2012 and projected consumption under alternative scenarios in major sectors in 2022 and 2040

Table 1.1 Actual and Projected Energy Consumption

Sectors	2012	2022		2040	
TWh		BAU	Ambitious	BAU	Ambitious
Buildings	238	568	525	1769	1460
Industry	2367	4010	3600	8764	7266
Transport	929	1736	1628	3828	3243
Pumps& Tractors	237	423	388	728	592
Telecom	83	131	124	207	164
Cooking	1072	829	684	524	467
Total	4926	7697	6949	15820	13192
% reduction in energy demand in 2040	17%				

Source: NITI Aayog, National Energy Policy 2017

1.4 PRESENT ENERGY CHALLENGES

The Energy challenges of today are manifold. More than six billion of the 7.3 billion inhabitants on earth today are living in the less developed regions of

44 NITI AAYOG, INDIA ENERGY SECURITY SCENARIOS 2047, http://iess2047.gov.in/pathways/22202222222222220222222220122222022222222211202220222022222/primary_energy_chart (last visited Mar 12, 2020).

45 *Id.*

46 *Id.*

the world[47]. People from the developed nations enjoy the fruits of development and lead quality life compared to their counterparts in less developed regions[48]. The less developed nations thrive to perform in the economic arena with increased investment in industrial and trade activities. Better economic conditions are inevitable for them to eradicate poverty and increase life expectancy. The economic performance of a country is greately depended on the availability of energy resources[49].

Eradicating poverty is directly related to generation of income[50]. To end starvation and poverty people required to have access to any kind of income. Income generation is directly connected to the available sources of energy. Farming, local businesses and the transportation of goods to markets depend largely on the availability of energy in different forms. Affordable energy is inevitable to have an income and lead a decent life. The UN and the World Bank have initiated many programs to reduce poverty across the globe. Accessible and affordable energy is one of the key ingredients of those initiatives[51].

The major share of the energy produced and consumed today is from fossil fuels. Coal, Oil and Gas occupy a key position in the global energy mix. Almost 85% of today's commercial energy need is met by them[52]. There is a greater demand for energy from developing nations when they embrace development and progress in that trajectory. The energy which these nations largely depend is fossil fuels. This will not only accelerate the depletion of such fuels, but also result in the generation of greenhouse gases at unprecedented levels. The global warming is also a major concern of this scenario. Thus it is

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47 *supra* note 1, Igor Ribeiro.

48 *supra* note 2, 2015 HUMAN DEVELOPMENT REPORT.

49 *supra* note 3 David Stern

50 EUROPEAN UNION, THE EUROPEAN UNION ENERGY INITIATIVE FOR POVERTY ERADICATION AND DEVELOPMENT, http://ec.europa.eu/environment/archives/wssd/ documents/energy_ initiative.pdf (last visited Jul 22, 2018).

51 GLOBAL MONITORING REPORT 2015/2016: DEVELOPMENT GOALS IN AN ERA OF DEMOGRAPHIC CHANGE 25–86, http://pubdocs.worldbank.org/en/1097014 43800596288/ PRN03-Oct2015-TwinGoals.pdf (last visited Jul 22, 2018).

52 *supra* note 4 KEY WORLD ENERGY STATISTICS 2015.

important that the world energy production and consumption move towards a more sustainable energy systems and consumption patterns. But what are sustainable energy systems is not defined in the policy documents of any governments. Some international agencies have defined but ignored many important aspects which are discussed later in this article.

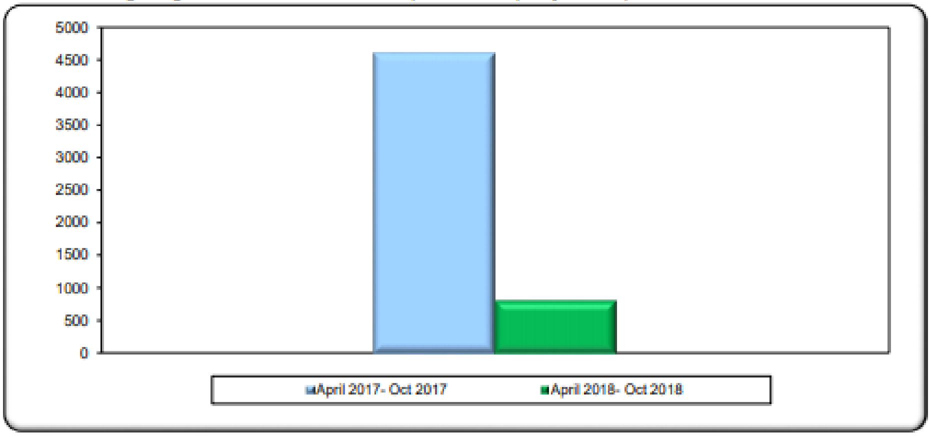
1.4.1 THE ENERGY GAP

During the 12th Five Year Plan period the target for capacity addition was 88537 MW and we have achieved 112% by adding 99209.47 MW. While the capacity addition targets were not met for hydro and nuclear power plants, the achievement was more than 100 percent for thermal power plants with a total addition of 91730.45 MW in place of the target of 72340 MW[53]. Thus the current status clearly shows the trajectory of the Indian power capacity addition, but the concern is the increasing addition of thermal plants which depend on imported fossil fuels and contributes to global warming.

Generating Capacity Addition during April 2017- Oct 2017 & April 2018- Oct 2018

	April 2017- Oct 2017	April 2018- Oct 2018	% Change
Thermal	4300	670	-84
Hydro	308	140	-55
Nuclear	0	0	NA
All India	4608	810	-82

Note * Lakwa Replacement Power Project (69.755 MW) had achieved COD on 26.04.18 but the intimation regarding COD was received in Oct'18. (Additional Capacity addition)



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Source: Central Electricity Authority

Fig. 1.3 Generating Capacity Addition

53 CENTRAL ELECTRICITY AUTHORITY, CENTRAL ELECTRICITY AUTHORITY INSTALLED CAPACITY, http://www.cea.nic.in/reports/monthly/installedcapacity/2017/ installed_capacity - 08.pdf (last visited Dec 15, 2018).

There is a decline in the power generation capacity additions made during April to October 2018 compared to the capacity addition made in the same period of the previous year. The government is now not encouragin the estableishment of new thermal power plants due to climate change and energy security reasosns.

There is an increasing gap in the electricity generation target from RES and the actual capacity addition. In case of thermal power plants we have achieved more than the target. This will accelerate the global warming and our dependency on fossil fuels. When we make a capacity addition in the thermal plant we are create an entire economic system depending on that. The resulting economic activity chain bear the carbon footprint and we need such planning for our future energy needs, that we minimize the carbon footprint[54].

Table 1.2 Mismatch between RE capacity envisaged under polity and capacity addition targeted

	2009-10	2010-11	2011-12	2016-17
Energy Requirement (in MU)[a]	820920	891203	968659	1392066
Share of RE as mandated under NAPCC (in %)[b]	5%	6%	7%	12%
Quantum of RE required (in MU)	41046	53472	67806	167048
RE capacity addition targeted by MNRE (in MW)	15542[c]	20376	25211	57000
Solar capacity targeted under JNNSM (in MW)			1000	10000
Quantum of RE available (in MU)[d]	29952	39269	50514	129122
Additional RE required to meet RE share mandated under NAPCC (in MU)	11094	14203	17292	37926

a As per 17th EPS
b 5% in 2009-10 & 1% increase each year
c As on 31.10.2009
d Assuming a capacity utilization factor of 22%

The Primary Energy Supply in India in 2016-17 was 8,17,370.21 Kilo Tonne of Oil equivalent (ktoe). The share of Coal was 64.17% and 31.25% by crude oil. In 2016-17, National Energy Consumption was 5,40,931.75ktoe. The industrial sector consumed 57.71 % of the total energy followed by transport

54 MICHAEL RENNER, SEAN SWEENEY & JILL KUBIT, GREEN JOBS: WORKING FOR PEOPLE AND THE ENVIRONMENT (2008).

sector with 8.44%, residential, agriculture/forestry, commercial and public sectors together another 13.90%[55].

1.4.2 RURAL ELECTRIFICATION

The shortage of power has adversely affected the rural electrification and universal electrification, an ambitious policy target of the government under the Rajiv Gandhi Gramin Vaidyutikaran Yojana (RGGVY), now rechristened as Deen Dayal Upadhyay Gramin Jyoti Yojana (DDUGJY)[56].

There is a clear gap in rural electrification from the target and actual achievement. The government fund allocation was only 47% of the required cost[57]. Thus it is inevitable to attract private investments to the sector to achieve universal provision of electricity.

1.4.2.1 Definition of Electrified Village

Prior to October 1997 the definition for an electrified village was “A Village should be classified as electrified if electricity is being used within its revenue area for any purpose whatsoever.” After October 1997 it was redefined as “A village will be deemed to be electrified if the electricity is used in the inhabited locality, within the revenue boundary of the village for any [58] purpose whatsoever[59].” The definition was modified as “Basic infrastructure such as Distribution Transformer and Distribution lines are provided in the inhabited locality as well as the Dalit Basti hamlet where it exists. Electricity is provided to public places like Schools, Panchayat Office, Health Centers, Dispensaries, Community centers etc. The number of households electrified

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55 *supra* note 5 DRAFT NATIONAL ENERGY POLICY NITI AAYOG, GOVERNMENT OF INDIA.

56 DEEN DAYAL UPADHYAYA GRAM JYOTI YOJANA, RURAL ELECTRIFICATION CORPORATION EXECUTIVE SUMMARY (2018) http://www.ddugjy.gov.in/mis/portal/ memo/executive_ summary/executive_ summary.pdf (last visited Nov 10, 2018).

57 DEEN DAYAL UPADHYAYA GRAM JYOTI YOJANA, GOV. INDIA 140356 (2017), http://www.ddugjy.gov.in/mis/portal/index.jsp.

58 *Id.*

59 Herath Gunatilake, Narasimhamurty Maddipati & Sumeet Patil, *Willingness to Pay for Electricity Supply Improvements in Rural India*, 10 J. Resour. Energy Dev. 55–78 (2013), http://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/RED-120104.

should be at least 10% of the total number of households in the village[60]." To eradicate energy poverty, it is important to redefine the term electrified village ensuring access to clean energy for all.

1.4.3 ENVIRONMENT CHALLENGES

World energy council pointed out that there exist many myths and misconceptions in the field of energy sector[61]. If not challenged that "may lead us down a path of complacency and missed opportunities as current pathways may fall short of delivering on the global aspirations of energy access, energy security, and environmental sustainability – the three dimensions that must be balanced in the energy trilemma."[62]

The sustainability index created by the world energy council highlights those countries, which through their energy policies have extended such policy measures that assure delivery of sustainable energy and economic development.

It is the national energy policy of each country that defines the energy mix in that country. There are various factors affecting the policy decision. The availability of resources, the geo political situations, cost of the fuel, international commitments etc., are factors which determines the energy mix of a nation[63]. India has more thermal power plants while France has most of its electricity produced from nuclear plants and Scotland from wind farms[64].

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60 MINISTRY OF POWER, LETTER NO. 42/1/2001-D(RE) (feb. 5th 2004); CORRIGENDUM VIDE LETTER NO. 42/1/2001-D(RE) (Feb. 17th 2004).

61 WORLD ENERGY COUNCIL, WORLD ENERGY TRILEMMA TIME TO GET REAL – THE MYTHS AND REALITIES OF FINANCING ENERGY SYSTEMS (2014), https://www.worldenergy.org/wp-content/uploads/2014/11/20141105-Main-report.pdf (last visited Jul 22, 2018)

62 *Id*

63 DEUTSCHE BANK, CURRENT ISSUES NATURAL RESOURCES (2014), http://www.dbresearch.in/PROD/DBR_INTERNET_EN-PROD/PROD0000000000337663/The_changing_energy_mix_in_Germany%3A_The_drivers_ar.PDF (last visited Jul 23, 2016)

64 INTERNATIONAL ENERGY AGENCY, MONTHLY ELECTRICITY STATISTICS (2016), http://www.iea.org/media/statistics/surveys/electricity/mes.pdf (last visited Jul 23, 2018)

Different countries use the earth's resources differently and the pollution impact by each country on the ecosystem is different. Whether all nations can equally contribute to the cause of protecting the natural resources and protecting the environment depends on whether the national policies reflect the ideology of sustainable energy systems. To bring the nations policies for the litmus test of sustainable energy systems, it is imperative to have a commonly understood definition for sustainable energy.

Based on various factors like geopolitical bargain of a nation and availability of natural resources, what a country may treat sustainable to them may not be sustainable to other nations. This is because sustainability has been understood to mean only the tradeoff between certain positive and negative factors of a particular energy system. For example, India is having huge energy requirement. It is also under international obligation to minimize the carbon footprint. More than 70% of its electricity production is using gas and coal[65]. India has more coal fired power plants to meet the demand[66]. We are polluting environment and exhausting the resources, but are attempting to meet the needs of the present generation.

Those countries which are relying on fossil fuels also can achieve certain other aspects of sustainability. They are increased efficiency, reduced consumption and proper management of greenhouse gas emissions[67]. We can also explore the means to use fossil fuels in a climate friendly way. Thus defining the term sustainable energy with its widest scope of the term and compelling the nations to meet most of the conditions of sustainability would be the ideal future of energy policy.

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65 INTERNATIONAL ENERGY AGENCY, INDIA ENERGY OUTLOOK - WORLD ENERGY OUTLOOK SPECIAL REPORT 2015 (2015), http://www.worldenergyoutlook.org/ media/weowebsite/ 2015/IndiaEnergyOutlook_WEO2015.pdf (last visited Jul 22, 2018)

66 GOVERNMENT OF INDIA, MINISTRY OF POWER, http://powermin.nic.in/content/xii-plan (last visited Jul 22, 2018)

67 Karl R. Rábago, *Efficiency and Renewable Energy are the Only Future We Can Afford*, RENEWABLE ENERGY WORLD, July 22, 2016, http://www.renewableenergyworld.com/ articles/2016/07/efficiency-and-renewable-energy-are-the-only-future-we-can-afford.html (last visited Jul 26, 2018)

Once the concept is exhaustively defined, various energy technologies, policies and energy intensive goods and services can be evaluated on the basis of sustainability for decision making. The evaluation based on sustainability provides better perspective of the tradeoffs between the derived benefits and adverse consequences to decide whether a particular technology or goods shall be preferred over the other.

By defining sustainable energy with the most relevant sustainability attributes of today, we can create the awareness among the students and new generations and pave a pathway for future policy decisions. It can create market conditions conducive for attracting investments and encourage initiatives that foster research and development in all areas of energy technology. The definition may give policy makers the vision to establish holistic policies to encourage the production and consumption of energy which meets the standards of sustainability. This will lead to the creation of energy infrastructure that supports and promotes sustainability. Countries providing high subsidies for fossil fuels[68] to their citizens and contributing to the accelerated pollution of the eco system can focus on achieving cheaper and cleaner energy sources and the funds used for subsidy can be diverted to other areas.

1.4.4 DEPLETION OF FOSSIL FUELS

The fossil fuels will get exhausted in another century[69]. The increased greenhouse gas emission from the fossil fuels is not going to make the world a better place than we found it[70]. It is going to degrade the environment considerably. Considering the growth in the energy demand, the fuel we burn

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[68] CAMBRIDGE, THE POLITICS OF FOSSIL FUEL SUBSIDIES AND THEIR REFORM, https://www.cambridge.org/core/services/aop-cambridge-core/content/view/B8CB7D383F33 AD9AF9CC82EB50A74DE5/9781108416795AR.pdf/The_Politics_of_Fossil_Fuel_Subsidies_and_their_Reform.pdf?event-type=FTLA (last visited Sep 8, 2018).

[69] BHARAT RAJ SINGH & ONKAR SINGH, GLOBAL TRENDS OF FOSSIL FUEL RESERVES AND CLIMATE CHANGE IN THE 21ST CENTURY, FOSSIL FUEL AND THE ENVIRONMENT (D. S. Khan ed., 2004).

[70] *Id*

annually is increasing year after year[71]. The quantities of greenhouse gases we emit also make an upward growth in this process.

Thus we need energy sources which shall not exhaust and shall not degrade the biosphere, to be called as sustainable. This problem actually been attempted addressing by the development of renewable energy sources. Solar and wind has addressed the issues above to a great extent. They don't generate greenhouse gases and are not exhaustible. But these forms of energy are not affordable to a large section of the society as renewable energy is comparatively costly[72]. Need to think beyond fossil fuels

1.4.5 BALANCE OF PAYMENTS

The Draft National Energy Policy 2017 acknowledges the over dependence of India on imported fossil fuels. We are at huge risk if the import is disrupted, and will undermine our energy security. It will also impact our balance of payment if the oil prices are increased in the international market. To overcome this situation, the new policy proposes to enhance the energy security through increased domestic production and efficiency[73].

1.4.6 ENERGY SECURITY

As long as fossil fuels remain cheapest energy source, sustainability concerns will take a back stage when it comes to addressing energy accessibility at affordable prices. Solar and wind technologies are yet not the cheapest sources of energy. They also cannot provide a stable supply of electricity unless supported by another source of power. It is inevitable that within a century, the fossil fuel deposits on earth will be completely consumed and burned into greenhouse gases. The energy sources will be completely non fossil fuel based. The transition is inevitable and it has begun.

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71 BRITISH PETROLEUM, ENERGY OUTLOOK 2030 (2016), https://www.bp.com/content/dam/bp/pdf/energy-economics/energy-outlook-2016/bp-energy-outlook-2016.pdf (last visited Jul 22, 2018)

72 K. Branker, M. J. M. Pathak & J. M. Pearce, *A review of solar photovoltaic levelized cost of electricity*, 15 RENEW. SUSTAIN. ENERGY REV 4470–4482 (2011).

73 *supra* note 5 DRAFT NATIONAL ENERGY POLICY NITI AAYOG.

India is over dependent on fossil fuels. More than 60% of its electricity is generated by thermal power plants. The Thermal Generation capacity will increase significantly in the coming decades according to NITI Ayog, the policy making body. According to the reports it has published[74] the thermal generation capacity to go up from the current 149GW (2012) to 290 GW in 2047. The coal based power generation will account for 253 GW while the remaining 37GW will be fired with gas[75]. This is 25.3% of the total electricity requirement and this is possible only if the other major sources of energy such as renewable, large hydro and nuclear power make their contribution of the remaining 74.7% of power generation. The policy clearly envisages a reduction in the share of the carbon fuels in the energy mix, but it is also pertinent to note that the quantity of fossil fuels required for power generation is almost double to the current levels of consumption.

1.4.7 ECONOMIC DEVELOPMENT

The National Energy Policy of India, 2017 proposes to achieve 100 per cent electrification of all census villages by 2018 and universal electrification with 24 × 7 electricity by 2022[76]. The Policy states that the primary objective is to banish energy poverty in India by making access to energy at affordable prices to the whole population of India. The other objectives of the policy are to achieve energy security, sustainability and economic growth through planning the energy future of India. Since all the energy forecasts suggest a huge surge in energy demand, the government of India shall plan its policy measures carefully to meet the future requirements. In addition to meet the energy demand, the government is also responsible to create demand for energy from the rural poor who have no access to clean energy.[77]

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[74] USER GUIDE FOR THERMAL POWER GENERATION SECTOR, http://indiaenergy.gov.in, http://indiaenergy.gov.in/iess/docs/Thermal-power-generation-documentation.pdf (last visited Sep 2018)

[75] *supra* note 5 DRAFT NATIONAL ENERGY POLICY NITI AAYOG.

[76] *Id.*

[77] *Id.*

1.5 FUTURE ENERGY SCENARIO

India is one of the fastest growing economies with second largest population fourth largest energy consumer and third largest economy. India houses 18 percentage of the world population which consumes only 6% is off the primary energy produced in the world. One of the most diversified sector in India is electricity. India targets to achieve 175 GW by 2022 and 275 DW by 2027[78]. India also plan to reduce its dependence on crude oil import by 10 percentage by 2022. India is also ambitious to make all car sales in the country by 2030 to be electric cars. Energy Efficiency is also given due importance towards attaining sustainability[79].

The GDP of India is growing at 6.3 % in 2nd quarter of the financial year 2018. India is also one of the top FDI destinations with 60.1 billion foreign direct investment in the year 2016-17. The World bank has improved India's ranking and it's 2019 ease of doing business. India is currently at 77 position. The GDP is expected to grow Apple 7 percentage in financial years 2018 and 2019. India is the fastest growing energy market in the world and currently the third largest energy consumer[80].

1.5.1 FUTURE ENERGY FORECAST

The India Energy Security Scenarios 2047[81] allows users to choose various pathways to create future energy scenarios. The future energy scenarios are examined using the NITI Aayog webtool.

India Energy Security Scenarios 2047 calculator (IESS 2047) is a web based open source tool for calculating potential future energy scenarios for India. The tool was launched by NITI Aayog In August 2015. The web tool explores

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78 *Id.*

79 DELOITTE, THE EVOLVING ENERGY LANDSCAPE IN INDIA OPPORTUNITIES FOR INVESTMENTS, (2018), https://www2.deloitte.com/content/dam/Deloitte/in/Documents/ energy-resources/in-enr-the-evolving-energy-landscape-india-april-2018-noexp.pdf (last visited Dec 15, 2018).

80 *Id.*

81 NITI AAYOG & INDIA SMART GRID FORUM, INDIA ENERGY SECURITY SCENARIOS *2047* 33 (2014), http://iess2047.gov.in/pathways/11101111111111110111 111111011111101121 11111101110111022222/my_story (last visited Dec 15, 2018).

all possible energy scenarios across all energy supply sources and demand sectors. The advantage of the tool is that it allows anyone to interactively make choices of combination of energy sources to explore various outcomes such as carbon dioxide emissions, import dependence, land use etc.

The tool is expected to play a key role in policy formulation as a guidance for policy makers in Planning India's energy future. It allows the users to forecast various Pathways and the resultant outcome of the chosen pathway in the future.

NITI Aayog vide press note dated 28th August 2015 expressed hope that the tool will help a more comprehensive policy discuss by policymakers, academicians, private sector and other stakeholders. The members of Niti Ayog expressed hope that the tool will support future energy planning for India to become self-sufficient in energy, achieve the target of 175 gigawatt of renewable energy capacity by 2022, rural electrification and reducing import dependency.

The IESS calculator will facilitate informed debates at various levels by different stakeholders. The tool allows a user to develop various Pathways and suggest changes in the policy to achieve energy security for the future. The IESS calculator is devised with the support of UK department for energy and climate change (DECC). More than 20 countries have now developed similar energy climate calculators.

The tool is now widely used by various stakeholders. IIT Mumbai has included IESS in its course curriculum. Mr. Montek S Ahluwalia, Himanshu Gupta and Nicholas Stern, used the calculator to study India's energy trajectory from 2012 to 2047 highlighting the implications for energy security and carbon emission[82]. The Centre for Policy Research, Prayas Energy Group,

[82] MONTEK S. AHLUWALIA, HIMANSHU GUPTA & NICHOLAS STERN, TOWARDS A SUSTAINABLE ENERGY STRATEGY FOR INDIA, NITI AAYOG 12 (2016), http://niti.gov.in/ writereaddata/files/document_ publication/Executive_Summary.pdf (last visited Jun 21, 2018).

and the Energy Research Centre, University of Cape Town used a 'multi-criteria decision analysis' (MCDA) approach with the help of the tool[83].

The new version of IESS 2047[84], version 2.0 was released by NITI Aayog with features like more user friendly, addition of analytical tools, accommodating different growth scenarios etc. According to NITI Aayog the new version takes into account the elasticity of energy demand across different sectors, cost scenarios, new policy measures, and new sources of energy[85].

Erstwhile Planning Commission, now NITI Aayog commenced the exercise of building energy security scenarios 2047 in the year 2013. The scenario takes into account the behaviour aspects, energy-related emissions, local resources and the women's, all sources of energy supply and demand, Technologies of global scale et cetera.

The first version of the web tool allows a user to observe the implications of a chosen pathway for energy scenarios depending on import dependence land use and carbon dioxide emissions. The new version allows a user to observe the implications of his choice on cost to the economy and greenhouse gas emissions. It has a large set of value additions in terms of Technologies sectors intensive modelling approaches etc.

The web tool has envisaged four levels of efforts in the energy sector. These four levels represents various policy efforts from the government to achieve the best possible results. These levels include least effort, determined effort, aggressive effort and heroic effort.

1.5.2 LEAST EFFORT SCENARIO

Least effort scenario assumes that there will be no effort in terms of policy interventions will be made on the demand and supply side. The energy

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[83] RADHIKA KHOSLA, NAVROZ K. DUBASH, ET AL., AN APPROACH TO SUSTAINABLE DEVELOPMENT BASED ENERGY AND CLIMATE POLICY (2015).

[84] *supra* note 44 NITI AAYOG.

[85] NATIONAL INSTITUTION FOR TRANSFORMING INDIA, REPORT OF THE EXPERT GROUP ON 175 GW RE BY 2022, https://niti.gov.in/writereaddata/files/ writereaddata/files/document_ publication/report-175-GW-RE.pdf (last visited Dec 4, 2018).

production levels from various sources under this scenario is estimated as follows[86]:

Table 1.3 Least Effort Scenario

GW installed capacity	**2012**	**2047**
Gas Power Stations	24	36
Coal power stations	125	253
Carbon Capture Storage (CCS)	0	8
Electricity Balancing Requirement	0	525
Back up electricity by diesel	15	384
Nuclear power	5	11
Hydro Power Generation	41	49
Solar PV	1	37
Solar CSP	0	10
Onshore Wind	17	67
Offshore Wind	0	4
Small Hydro	3	9
Distributed Solar PV	0	9
Biomass	5	5
Waste to Electricity	0	0
Standby / peaking gas	0	0
Total	221	1023

Source: IESS 2047

Under this scenario there are more coal power plants and cause more pollution. This is not an ideal future energy security scenario.

1.5.3 DETERMINED EFFORT SCENARIO

Under the scenario the most achievable result by implementing current policies and programs with a determined effort is considered. The determined effort scenario is considered as the most achievable scenario[87].

[86] *supra* note 81 NITI AAYOG.

Table 1.4 Determined Effort Scenario

GW installed capacity	**2012**	**2047**
Gas Power Stations	24	50
Coal power stations	125	333
Carbon Capture Storage (CCS)	0	35
Electricity Balancing Requirement	0	271
Back up electricity by diesel	15	0
Nuclear power	5	26
Hydro Power Generation	41	75
Solar PV	1	150
Solar CSP	0	46
Onshore Wind	17	202
Offshore Wind	0	20
Small Hydro	3	15
Distributed Solar PV	0	47
Biomass	5	11
Waste to Electricity	0	4
Standby / peaking gas	0	0
Total	221	1285

Source: IESS 2047

The energy requirement based on the demand forecast under this scenario is higher due to higher levels of income and economic growth. There is more renewable wind and solar addition along with coal power plants can be seen in this scenario. Since there are more coal power plants added in this scenario, it cannot be an ideal future energy scenario[88].

1.5.4 AGGRESSIVE EFFORT SCENARIO

This scenario describes as significantly improved effort from that of the determinant of a scenario which is likely to achieve and deliverable but difficult without a focused aggressive effort. There require an all-round effort

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[87] *Id.*

[88] USER GUIDE FOR INDIA'S 2047 ENERGY CALCULATOR TRANSPORT SECTOR CONTENTS, http://indiaenergy.gov.in/iess/docs/Transport-doc.pdf (last visited Aug 10, 2018).

from all stake holders led by appropriate government policies to achieve this scenario[89].

Table 1.5 Aggressive Effort Scenario

GW installed capacity	**2012**	**2047**
Gas Power Stations	24	83
Coal power stations	125	459
Carbon Capture Storage (CCS)	0	80
Electricity Balancing Requirement	0	0
Back up electricity by diesel	15	0
Nuclear power	5	45
Hydro Power Generation	41	105
Solar PV	1	248
Solar CSP	0	90
Onshore Wind	17	270
Offshore Wind	0	62
Small Hydro	3	20
Distributed Solar PV	0	111
Biomass	5	23
Waste to Electricity	0	6
Standby / peaking gas	0	0
Total	221	1602

Source: IESS 2047

An excess electricity production of 2433 TWh with 33% of energy coming from renewables by 2047. Renewables require standby support in terms of alternate capacity or additional gas based capacity[90].

1.5.5 HEROIC EFFORT SCENARIO

This scenario considers the most ambitious and extremely aggressive changes to achieve extremely difficult targets through changes in the physical and

[89] NITI AAYOG, NITI'S ENERGY SECTOR PLANNING TOOL-IESS, 2047, http://niti.gov.in/content/niti's-energy-sector-planning-tool-iess-2047 (last visited jun 21, 2018).

[90] *supra* note 81 NITI AAYOG.

Technical capabilities. This scenario over generates 5972 TWh of electricity which can be exported. To balance the 39% from renewable energy production, the IESS suggest to have an additional 140 MW gas based capacity[91].

Table 1.6 Heroic Effort Scenario

GW installed capacity	2012	2047
Gas Power Stations	24	132
Coal power stations	125	591
Carbon Capture Storage (CCS)	0	90
Electricity Balancing Requirement	0	0
Back up electricity by diesel	15	0
Nuclear power	5	78
Hydro Power Generation	41	150
Solar PV	1	479
Solar CSP	0	187
Onshore Wind	17	410
Offshore Wind	0	141
Small Hydro	3	30
Distributed Solar PV	0	264
Biomass	5	20
Waste to Electricity	0	6
Standby / peaking gas	0	0
Total	221	2578

Source: IESS 2047

1.5.6 THE ELECTRICITY SECTOR CURRENT SCENARIO

The ministry of power Government of India updates the power sector information on its website on a regular basis. According to the latest information made available as on 19th July 2018 the total installed capacity of electricity in India is 343899 megawatt of which the state governments and

[91] *Id.*

the State Electricity sector provides 24.6 percentage of the total installed capacity amounting to 84627 megawatt of power[92]. The central sector contributes 30.2 percentage with an installed capacity of 103761 megawatt. The private sector contribution in the total installed capacity is 45.2 percentage with 155511 megawatt of power[93].

Carbon emission is a major concern today because of the increasing global warming and the policymakers try to limit the Global Warming below the two degree Celsius limit. India being a developing Nation price to perform in the economic scenario with more energy consumption. The total Thermal Power India produce constitutes 64.8 percent of the total electricity produced in India this amounts to 222693 megawatt of power coming from coal gas and oil powered electricity power plants.

Coal is a major contributor in India's electricity generation capacity with 50 7.3% of the total installed capacity up electricity is in the Coal fired power plants with 196958 Megawatt of power. Gas power stations produce 24897 megawatt of power and contribute 7.2 % of the total installed capacity and diesel power plants form point to percentage with 838 megawatt of installed capacity[94].

All renewable energy sources excluding the hydro power stations contribute 20.1 percentage with an installed capacity of 69022 megawatt. Hydro power stations contribute 13.2 percentage with uninstall the capacity of 45403 megawatt. The remaining two percentage of electricity comes from nuclear fuels with an installed capacity of 6780 megawatt[95].

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[92] *supra* note 82 AHLUWALIA, GUPTA, AND STERN.

[93] *supra* note 19 CENTRAL ELECTRICITY AUTHORITY.

[94] *supra* note 53 CENTRAL ELECTRICITY AUTHORITY.

[95] *supra* note 31 C.E.A.

Table 1.7 Power Supply Position 2018-19

The power supply position in the country during 2009-10 to 2018-19 :

Year	Energy				Peak			
	Requirement	Availability	Surplus(+)/Deficts(-)		Peak Demand	Peak Met	Surplus(+) / Deficts(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
2009-10	8,30,594	7,46,644	-83,950	-10.1	1,19,166	1,04,009	-15,157	-12.7
2010-11	8,61,591	7,88,355	-73,236	-8.5	1,22,287	1,10,256	-12,031	-9.8
2011-12	9,37,199	8,57,886	-79,313	-8.5	1,30,006	1,16,191	-13,815	-10.6
2012-13	9,95,557	9,08,652	-86,905	-8.7	1,35,453	1,23,294	-12,159	-9.0
2013-14	10,02,257	9,59,829	-42,428	-4.2	1,35,918	1,29,815	-6,103	-4.5
2014-15	10,68,923	10,30,785	-38,138	-3.6	1,48,166	1,41,160	-7,006	-4.7
2015-16	11,14,408	10,90,850	-23,558	-2.1	1,53,366	1,48,463	-4,903	-3.2
2016-17	11,42,929	11,35,334	-7,595	-0.7	1,59,542	1,56,934	-2,608	-1.6
2017-18	12,12,134	12,03,567	-8,567	-0.7	1,64,066	1,60,752	-3,314	-2.0
2018-19*	3,25,428	3,23,418	-2,009	-0.6	1,71,973	1,70,765	-1,208	-0.7

* Upto June 2018 (Provisional), Source : CEA

Source Central Electricity Authority

The above table shows the performance of the power sector in terms of demand and supply of electricity in the country in the past decade. The data clearly shows a decrease in the energy deficit over the period suggesting an increased power generation to meet the demand at peak and non-peak hours. But energy demand is not static as it grows along with the economic growth. The economy grows above 5% and the energy consumption will have a direct impact of the economic growth. It is therefore important for the power industry to keep up with the economic growth of the country.

1.5.7 ECONOMIC GROWTH SCENARIOS

The changing economic growth conditions of the country and its variability has been taken into consideration for forecasting the energy security scenarios of India for 2047.

1.5.8 THE GDP GROWTH SCENARIOS

There are three levels of security scenarios envisaged. In level 1 which is called as scenario A assumes a Compounded Annual Growth Rate (CAGR) of 7.4% till the year 2047 which is a projection done by TERI for Indian GDP till 2052[96]. Scenario B assumes a CAGR of 6.7% which is adopted from the assumptions of the International Monetary Fund for the 12th Five year Plan and Scenario C which assumes a 5.8% CAGR from the growth rate assumptions of the International Energy Agency.

The future energy demand is forecasted based on these GDP assumptions and the elasticity of activity levels in various sectors. The tool also allows to know the cost implications of the scenarios.

1.5.9 DEMAND ANALYSIS AND FORECAST

NITI Aayog has identified 6 sectors which will drive the energy demand. The six sectors identified by NITI Aayog to forecast the future energy demand are transport, industry, cooking, buildings, agriculture and replacement of diesel in telecom sector. The decade ending 2010-11 has witnessed an annual growth rate of 7% and the Industry sector has doubled during the period. The sector has consumed 45% of the total energy demand. Within this sector there are seven major sub industries which consume the highest proportion of energy. They are aluminum, cement, chloralkali, fertilizer, iron and steel, pulp and paper, and textiles[97].

At the core of the proposed energy policy for industries is energy efficiency. The huge energy demand that may arise from the industrial sector in 2047 is proposed to be addressed through four levels of technology options with efforts to achieve extreme levels of energy efficiency. The Bureau of Energy Efficiency has rolled out policy mechanisms to improve Energy Efficiency. The Perform-Achieve-Trade scheme of the bureau penalizes noncompliance

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[96] *supra* note 81 NITI AAYOG.
[97] *supra* note 89 NITI AAYOG.

of Energy Efficiency targets and incentives energy savings through a mechanism of trading excess energy savings.

The four levels of technology options include combination of energy sources with increased levels of energy efficiency. All improved technology options suggest an increased consumption of electricity from grid or other sources to reduce carbon emission. An increased electricity share in the energy consumption even in an energy efficient scenario requires more electricity being produced to meet the scenario. Industry can be seen moving forward with increased energy efficiency and increased consumption of electricity.

There will be significant changes in the transport sector for the coming future. The demand and mode of transport will consider Valley change when the economy grows and fossil fuels start to decline. The motorized transport in India moves on roads, rail and air. Transport sector is the second highest energy consuming sector after industry and India. The booming vehicle industry market and the increased vehicle population in India will create high demand for energy in the future. It is the transport sector which is responsible for the highest consumption of Petroleum products.

Even though there is an increase in movement of goods through pipelines, coastal shipping and inland waterways, Road Transport remain the major means of transport in India. The lack of a strong public transport system increases the dependency on private vehicles for passenger transport. Road transport accounted for 85% of the total passenger traffic[98] while 14% was through rail and remaining 1% through air in the year 2012[99]. The major source of energy fueling the transport sector is fossils. The energy demand scenarios predict an increase in demand in this sector.

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98 NITI AAYOG, DOMESTIC PASSENGER TRANSPORT MODE, http://iess2047.gov.in /assets/ onepage/ Domestic Passenger Transport Mode.pdf (last visited Dec 16, 2018).

99 *Id.*

The Railways have moved from diesel engines to electric engines[100]. The total trunk roads extending to 64460 kilometres will be electrified in the coming future. Currently the total electrified routes accident 20275 km. It took a decade from 2001 to 2011 to electrify 6000 km. But to keep up with the economic growth the railway need to increase the pace at which their rectification activities are being carried out and the enter freight and passenger transport salary shifted to electric transport. This is soon going to increase electricity consumption by the Railways. The Railways are well documented the electricity consumption for abs electricity traction providing a reliable data.

Electric traction as a mode of transport has several merits such as higher motor efficiency is compared to petroleum fuel engines, the vehicles are highly expensive trending because Thomas to make shift electric vehicles. The electric vehicles population is thus very less in India and in future the increased cost of fossil fuels and improved technological innovations may reduce the cost forces vehicles. Private vehicles offer more energy efficient solutions such as hybrid, plug-in hybrid, and electric and plug in electric vehicles. This options provides four levels of efficient vehicle population in the future. Energy security scenario tool allows the user to choose from any of these four levels of vehicle population. The below table shows the penetration of electric vehicles by 2051-52 under various levels of trajectories[101].

The above levels shows the use of electric vehicles for passenger transport and level 1 envisages the least proportion of electric vehicles in the total number of vehicles while level 4 assumes the maximum. The electric vehicles are considered to be the most energy efficient modes of transport and are classified into three categories of Cars, Two Wheelers and Buses. Two wheelers are expected to have an increased share in all the four scenarios assumed above[102].

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[100] *Id.*

[101] *supra* note 98 NITI AAYOG.

[102] *supra* note 99 NITI AAYOG.

In 2011-12 the share of electric vehicles in the market was only 1% and was mainly in the two wheeler segment. At level 1 the electric two wheelers are expected to reach 18% by 2046-47 due to lack of government incentives for promotion. Though Electric Trucks are now being introduced in the western countries, it can be observed that such possibilities have not been considered in the India Energy Scenarios 2047. The electricity consumption in the freight transport is assumed to be mainly in the railways. But it is important to create infrastructure for road transport with electric trucks as a future option[103].

1.5.9.1 Electric Vehicles

The Electric Vehicles (EVs) in the passenger car segment grew by 38% in 2016 reaching to 750,000 units of which 340,000 was in China. But the total share of the EVs in the car sales worldwide is 1.1% and share in the car stock is 0.2%. The EVs sold in 2016 will reduce the demand for oil by 10,000 barrels per day and impact electricity demand by 1 TWh. According to IEA, it is vital to maintain a steady sales growth till 2025 in the EVs to meet the required deployment levels of EVs to keep the global warming at below 2 degree Celsius climate mitigation scenario. There need to be decarbonizing of electricity generation and charging facilities. The IEA data shows that there was an investment of USD 6 billion in over 880,000 charging points in 2016 showing a 42% growth compared to 2015.

In 2017 the market share has increased due to the USD 43 billion spending on passenger vehicles by consumers[104]. The impact of such increase in electric vehicles have not impacted the demand for fossil fuels in the transportation sector.

The growth of the EVs sales is driven by government encouragement to encourage consumers to buy EVs and incentivize manufacturers to invest in its development and commercialization. According to the IEA estimates the

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[103] *supra* note 98 NITI AAYOG.

[104] Bloomberg, *State of Clean Energy Investment 2018*, BLOOMBERG NEF, https://about.bnef.com/clean-energy-investment/ (last visited Aug 29, 2018).

governments spent around USD 6 billion on incentives globally mostly in the form of fiscal incentives such as grants, tax credits and tax exemptions and spending on public charging infrastructure[105]. Norway has the highest EV sales share with strong government purchase incentives to consumers and the public charging facilities deployed by the government is supporting sales in Netherlands, which has the second highest share of EVs sales[106]. Other promotional measures include privileged access to certain areas and lanes of the road network and parking spots. In China, additionally, EVs are exempt from certain licensing restrictions. The prices of the EVs are expected to decline in the future due to economies of scale and decreased battery prices. Even though the recent decline in the battery prices have been translated in to distance range of the vehicles rather than a reduction in the prices. The average distance range of EVs in China is 200 km and in United States 290 km[107]. The ambitious target of the automakers is to have 10 million sales per year in the next decade.

Chinese manufacturers lead the table with 350 thousand sales in 2016 while others are lagging way behind. There is no Indian manufacturer being listed in the table. A 20% reduction in the subsidy levels to guide the market away from the small law speed EVs has resulted in sales reduction in the early quarters of 2017. China also recorded 116,000 electric buses in 2016[108]. This accounts for the 95% of the global market. This displaces a massive oil consumption in China. China has also believed to have sold 25 million two-wheelers also during this period.

The launch of Tesla Model X BEV has pushed the sales of EVs by 40% in 2016. The policy outlook for EVs in United States are not bright with governments reducing incentives and increasing taxes for such vehicles by

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105 INTERNATIONAL ENERGY AGENCY, WORLD ENERGY INVESTMENT 2017, www.iea.org/t&c/ (last visited Sep 8, 2018).

106 *supra* note 14 RENEWABLE ENERGY STATISTICS 2018.

107 *supra* note 105 INTERNATIONAL ENERGY AGENCY.

108 *Id.*

mid-2015. The Corporate Average Fuel Economy (CAFÉ) standards compels the automakers to increase the sales in EVs segment to compensate for sales of conventional vehicles. There is uncertainty on the future of this program in United States.

The changes in the tax incentives in Netherland has resulted in a dip in the sales in Europe, though there is an absolute sales growth by 25 thousand EVs. Whereas few other countries have introduced new policy measures have helped to keep up the hopes. Polish Government has announced to invest in a domestic EV manufacturer and has a target to put one million EVs on the road by 2025[109]. Germany has a policy for purchase incentives, Austria is creating a nationwide network of charging points, and United Kingdom is providing public support to a factory to build 20000 PHEV taxis and aims to achieve the target that all new taxis be electric by 2018. Japan has reduced the subsidy for EVs which has affected the growth of sales in EVs in 2016, though the share in BEVs has raised with the introduction of Leaf by Nissan in the market. South Korea has announced a target of EVs of 30% of total car sales by 2020 and has subsidies of USD 11 000 for BEVs. They also provide city level incentives and tax breaks.

Indian conditions were different from that of the world scenario. The sales of EVs in the car segment were under 1000, which is the direct reflection of publicly accessible chargers and affordability of EVs for the middle class. Whereas electric two-wheelers has recorded a sales of 25000 in the year 2016. The government offers a subsidy of USD 2000 to car buyers but is comparatively a less attractive incentive.

1.6 FUTURE ENERGY CHALLENGES

Whichever scenarios we discussed, have a good contribution of electricity from renewable energy sources. If the renewables fails to provide the electricity supply as mentioned in each scenario, it will lead to more gas or coal based capacity addition. Any thermal power plant will accelerate the

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[109] *supra* note 14 RENEWABLE ENERGY STATISTICS 2018.

global warming and climate change. The sustainability of the human race and all the life on earth will be in danger if there are more thermal power plants and fossil fuel consumption.

1.6.1 EXISTING DEFINITIONS OF SUSTAINABLE ENERGY

Although there are no attempts to provide a legal definition to the phrase 'sustainable energy' can be traced, a small town in New Hampshire has attempted to define 'unsustainable energy' and banned 'unsustainable energy' development within its jurisdiction. Section 2e of the local ordinance (Grafton Community Bill of Rights Ordinance) defines 'unsustainable energy' as "*Unsustainable energy systems* means those systems that are controlled by state and federal energy policies, rather than community controlled energy policies; hydroelectric power and industrial scale wind power when it is not locally or municipally owned and operated; energy systems using fossil fuels, including but not limited to coal, natural gas, petroleum products, nuclear and radioactive materials, and other fuel sources that are non-renewable, or which produce toxins and substances that cause injury to humans or natural communities and ecosystems, or that are in violation of residents' rights to a sustainable energy future. The phrase shall also include any energy system which violates the rights secured under this Ordinance or under other laws. The term shall not include the use of propane, kerosene, heating oil, coal, or natural gas when combustion of those fossil fuels is used solely to generate on-site heat or power and the energy produced is not commercially sold, transmitted, or distributed.[110]"

The above definition cannot be relied on for ascertaining the sustainable energy sources. The definition is too limited to serve the local political situation. The definition states that all commercial energy production within the local limits unsustainable, even if it is environmental friendly and all energy sources are sustainable, even if it is not environmental friendly, if produced for their own consumption and not at commercial levels.

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[110] COOS COUNTY, ESTABLISHING A COMMUNITY BILL OF RIGHTS PROVIDING FOR A SUSTAINABLE ENERGY FUTURE (2014), http://celdf.org/wp-content/uploads/ 2015/10/ Coos_County_OR_ Ordinance.pdf (last visited Jul 22, 2018)

There are diverse views on what sustainable energy means. One such definition states that "sustainable energy: a dynamic harmony between the equitable availability of energy-intensive goods and services to all people and the preservation of the earth for future generations[111]."

This definition is the more realistic definition of the concept so far. The definition has ignored the efficiency aspect of sustainability. The authors have but discussed some of the limitations of this definition in these words: "We treat energy technologies as being sustainable if their net effects upon the biosphere do not significantly degrade its capabilities for supporting existing species in their current abundance and diversity. This definition is inherently conservative and favorable to the status quo. It reflects our ignorance in assessing the quality of alternative ecosystems (some of which might be preferable to what exists now) and in understanding our effects upon them."[112] Any source of energy which is not degrading the current ecosystem can be treated as sustainable because we have not yet discovered a system that can actually improve the ecosystem from what it is today.

As far as renewable energy is concerned, the international organizations and governments are broadly on consensus. But when it comes to sustainability attributes of the energy, every nation and organization has different approaches. While some have expressly included sustainability concerns in defining renewable energy some did not. The International Renewable Energy Agency (IRENA) has defined renewable energy as: "renewable energy includes all forms of energy produced from renewable sources in a sustainable manner, including bioenergy, geothermal energy, hydropower, ocean energy, solar energy and wind energy[113]."

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[111] JEFFERSON W. TESTER, ELISABETH M. DRAKE, MICHAEL J. DRISCOLL, MICHAEL W. GOLAY & WILLIAM A. PETERS, SUSTAINABLE ENERGY: CHOOSING AMONG OPTIONS 10 (2005).

[112] *supra* note 33 C.E.A.

[113] WORLD BANK & INTERNATIONAL ENERGY AGENCY, SUSTAINABLE ENERGY FOR ALL 2013-2014: GLOBAL TRACKING FRAMEWORK 164 (2014), http://hdl.handle.net/10986/16537 (last visited Jul 24, 2018)

Some agencies have defined renewable energy and included the sustainability aspects in it. The definition provided by International Energy Agency (IEA) for renewable energy resources as those "derived from natural processes" and "replenished at a faster rate than they are consumed" (IEA 2002, OECD, IEA and Eurostat, 2005). The IEA definition of renewable energy includes the following sources: "electricity and heat derived from solar, wind, ocean, hydropower, biomass, geothermal resources, and biofuels and hydrogen derived from renewable resources" (IEA 2002)[114].

These definitions vary in the type of sources included and in whether sustainability considerations are explicitlyincorporated. These differences illustrate the fact that there is no common or global definition of sustainable energy.

The world moves in the direction of renewables and it is taking into account the environmental aspect and the renewability aspect. Energy production from these sources is comparatively low and is more costly and depends on the uncertain natural factors like sunlight and wind. There are no internationally accepted sustainability criteria covering the major technologies, and it is therefore very difficult to distinguish between sustainable and less sustainable deployment.

1.6.1.1 Solar Energy as a sustainable source of energy

Solar energy is one such source of energy which will meet most of the sustainability attributes of the sustainable energy as defined above. It is thus the source of energy the world policy makers may give attention to. Creating a robust legal framework to achieve the abundance of energy production through sustainable solar is the primary objective of policy makers.

1.7 THE ENERGY GAP AND ENERGY PLANNING

India is over dependent on fossil fuels. More than 60% of its electricity is generated by thermal power plants. The Thermal Generation capacity will increase significantly in the coming decades according to NITI Ayog, the

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[114] *Id*

policy making body. According to the reports it has published the thermal generation capacity to go up from the current 149GW (2012) to 290 GW in 2047. The coal based power generation will account for 253 GW while the remaining 37GW will be fired with gas. This is 25.3% of the total electricity requirement and this is possible only if the other major sources of energy such as renewable, large hydro and nuclear power make their contribution of the remaining 74.7% of power generation. The policy clearly envisages a reduction in the share of the carbon fuels in the energy mix, but it is also pertinent to note that the quantity of fossil fuels required for power generation is almost double to the current levels of consumption[115].

Table 1.8 The Energy Gap

Central Electricity Authority **LGBR: 2018-19**

	Energy (MU)	Peak (MW)
Requirement	1,213,325	164,066
Met	1,204,697	160,752
Gap	-8,629	-3,314
Gap (%)	-0.7	-2.1

Source: CEA

There is a total energy supply deficiency of 8,629 Million Units and a peak hour deficiency of 3314 MW constituting 0.7% and 2.1% of energy gap which need to be addressed. While the economy is growing at an average 7% the energy sector should also match with the growth and shortage of energy will negatively impact the growth[116].

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[115] Sujith P Surendran & Dr. Tabrez Ahmad, *The Required Policy Change in Energy Sector for India's Energy Security*, 1 INT. J. TREND SCI. RES. DEV. 1020–1026 (2017), http://www.ijtsrd.com/papers/ijtsrd5752.pdf%0Ahttp://www.ijtsrd.com/humanities-and-the-arts/social-science/5752/the-required-policy-change-in-energy-sector-for-indias-energy-security/ sujith-p-surendran.

[116] CENTRAL ELECTRICITY AUTHORITY, CENTRAL ELECTRICITY AUTHORITY LOAD GENERATION BALANCE REPORT 2018-19, http://www.cea.nic.in/reports/ annual/lgbr/lgbr-2018.pdf (last visited Dec 16, 2018).

1.8 INVESTMENTS IN THE ENERGY SECTOR

There are various barriers which prevent an increased deployment of renewable energy technologies. The barriers include market and social barriers, information barriers, regulatory barriers and financial barriers. Some of these barriers can be overcome through adopting an appropriate business model. By "business model" we mean "a strategy to invest in renewable energy technology which creates value and leads to an increased penetration of renewable energy technology in the energy sector". One of the factors of investment attractiveness of any country is the stability of legal conditions for investing. In the legal terms it is provided with two ways: the guarantee from the unfavorable change of legislation ("grandfather's" clause) and the change of an investment contract in connection with the change of legislation[117].

1.8.1 LACK OF GOVERNMENT RESOURCES

The Investment requirement for future energy security in India is huge. The government alone cannot achieve the huge investment requirement. Private investors should be allowed to invest and build the sector. For any private investor to invest, the sector should be commercially viable. There shall be minimum market risks and lesser hurdles to invest. As a measure to promote investments in the sector, governments have offered subsidies. The Frank Furt School-UNEP Centre, in its study titled "Global Trends in Renewable Energy Investments 2013" analyzed renewables investment in European Union, United States and emerging markets. It also discusses overall energy trends, technical costs, subsidies etc. The study finds that many countries have adopted subsidies as a measure to promote renewable energy. Subsidies are not a long term solution for attracting investments. Subsidies are not viable in long term. Thus it is time for the governments to move further to devise mechanisms which are sustainable in long run[118].

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117 Sujith Surendran & Tabrez Ahmad, *Need for a comprehensive renewable energy law*, 2 INT. J. MANAG. LAW SCI. STUD. 19–26 (2017), https://drive.google.com/drive/u/ 0/folders/ 1Ugp_52bQI1McfFSidaAxTWUGaltYmAbt (last visited Dec 15, 2018).

118 *Id.*

1.8.2 NEED FOR PRIVATE INVESTMENT

The promotion of renewable energy is negatively impacted by the unavailability of non-recourse financing and is a critical hurdle in the expansion plans of developers. They cannot continue to accumulate recourse on their balance sheet without adequate financing. Various institutions like Bank of Baroda, Axis Bank, ICICI, IFC, ADB etc. are the major financiers in the Indian renewable energy sector. Lenders have concerns with regard to debt recovery and the legal enforceability of claims in India. The cost of debt finance in India is 13-14% and the disputed debt to be recovered is ` 2 Trillion. The debt –equity ratio in renewable energy projects are 70:30. The debt finance required for solar projects alone in 2013 was ` 60 Billion[119].

1.8.3 NEED FOR REGULATORY FRAMEWORK TO PROMOTE BUSINESS IN SOLAR

This study examines the current law and policy affecting the renewable energy deployment in India. The Study has identified that the focus of law and policy to promote renewable energy is at the point of market access. But the thesis argues that we should make the investment and regulations regarding accumulation of funds and investments more investor friendly to attract investments in the sector. The Study concludes that there requires a comprehensive renewable energy law which addresses all the aspects of renewable energy generation, from investment finance to market access[120].

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[119] BRIDGE TO INDIA, BRIDGE TO INDIA SOLAR HAND BOOK CEO SURVEY 2017, Https://Www.Bridgetoindia.Com/Wp-Content/Uploads/2017/05/Bridge-To-India_India-Solar-Handbook_2017-1.Pdf (Last Visited Dec 4, 2018).

[120] *supra* note 117 Sujith Surendran & Tabrez Ahmad.

CHAPTER 2
REVIEW OF LITERATURE

2.1 SURVEY OF LITERATURE

1) M. R. Mallick, Commentaries on the Electricity Act, 2003, with All Rules, Regulations & Orders, Kamal Law House, 2006

The Book is a commentary of the Electricity Act 2003 and discusses the provisions of the Act with latest case laws. The objective of the legislation and mandate it has can be understood from the discussion of the preamble to the Act. The Preamble to the Electricity Act 2003 states the objectives of the act as:

> An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff , ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

It is clear from the commentary given in the book that one of the mandates of the Act is to develop the electricity sector and promote competition. Thus, the existing primary legislation on the subject, which is the Electricity Act 2003, promotes competition in the market which is a precursor for private investments in the sector. It also envisages the "promotion of efficient and environmentally benign policies", which can be understood to mean the promotion of technologies like solar for power generation.

2) S.K. Chatterjee, Electricity laws of India, ed.2012, Delhi Law House.

The Book is a commentary of the Act which discusses the provisions of the Electricity Act with latest case laws. The Act has only very few provisions which directly deals with the renewable energy. The provision which has a direct impact on the promotion of renewable energy is section 86. (1) which states as follows:

> The State Commission shall discharge the following functions, namely: - (e) promote cogenration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence.

Though section 86 (1)(e), is a small provision in the entire Electricity Act 2003, it has laid down the foundation for entire policy and regulatory framework for development of renewable energy. It mandates the state electricity commission to adopt suitable measures for promoting generation and cogeneration of renewable power, grid connectivity, Open Access, Renewable Purchase Obligation, and Consumption Obligations on Distribution Licensees.

3) J. Jeslin Drusila Nesamalar, P. Venkatesh & S. Charles Raja, The drive of renewable energy in Tamilnadu: Status, barriers and future prospect, 73 Renew. Sustain. Energy Rev. 115–124 (2017).

This article focuses on the southernmost state of India Tamilnadu when its endeavor to harness renewable energy. The article acknowledges the efforts at the government level by bringing various policies for encouraging renewable energy in the state. The article also credit such policies success to the extent that Tamilnadu is one of the states with highest Renewable energy capacity. The also criticize the lack of a comprehensive approach to promote renewable energy through more public awareness and enhanced research and development in the sector. They also warn the government in having consistency in policy measures and falling short of action beyond bringing policy measures.

4) Tedd Moya Mose, toward a harmonized framework for international regulation of renewable energy, Advance Article Unif. Law Rev. 1 (2018)

The author proposes harmonization of doctrinal and functional International legal Framework for renewable energy. The authors suggest that there need not be a new renewable energy law (*lex renewabilia*) created at the international level but overarching International Energy Law combining normative and functional elements to create a good matrix to assess the operative issues and prospects and balancing promotion of renewable energy. The article recognise the prominent role of soft law in a harmonised renewable energy framework. Soft law can play an important role in interpreting hard law. This adds teleological value to soft law. It also will help building broad consensus among various stakeholders through development of operative guidelines in the sector. This will result in a dynamic Legal Framework for the renewable energy sector.

The author concludes that the lack of harmonized international renewable energy law creates the need for an International Energy law overarching all sources of energy.

5) Venkata Ramana, C.S. Sinha & P.R. Shukla, Renewable energy technologies and climate change policies in India, 15 Int. J. Glob. Energy Issues 97–116 (2001)

The authors in this article review renewable energy Technologies and the policies from 1980 till the end of 1998. The Solar Energy can be seen as a clear winner and evolved technology towards achieving the status of global leader in renewable energy technologies.

6) Sunil Luthra et al., Barriers to renewable/sustainable energy technologies adoption: Indian perspective, 41 Renew. Sustain. Energy Rev. 762–776 (2015)

The main objectives of this research paper are:

Identify various barriers to adoption of renewable or sustainable energy Technologies in the Indian context and rank the identified barriers based on analytic hierarchy process. The paper has identified 28 barriers to renewable or sustainable energy Technologies adoption and they have been further classified into 7 representative dimensions based on the nature of barrier.

7) Sudhakar Reddy & J. P. Painuly, Diffusion of renewable energy technologies-barriers and stakeholders’ perspectives, 29 Renew. Energy 1431–1447 (2004)

The authors of the paper present the results of a survey conducted among households, personal belong to industry and commercial establishments, and policy Experts. The objective of the paper is to understand the consumer perspective to help develop policies to intervene in areas of concern by defining each barrier and its influence on the consumers. The survey reveals how the consumers perceive information regarding renewable energy technology and make decisions using there limited understanding. The survey was conducted in the state of Maharashtra.

This study used a multiphase, stakeholder-based research. Stakeholder representatives participated in working groups formed to discuss the mode of survey and identify critical obstacles to data-collection.

8) Bridge to India Energy Pvt. Ltd., India Solar Decision Brief: Bankability and Debt Financing For Solar Projects in India (2013)

The report states that, unavailability of non-recourse financing is a critical hurdle in the expansion plans of developers as they cannot continue to accumulate recourse on their balance sheet. Various institutions like Bank of Baroda, Axis Bank, ICICI, IFC, ADB etc. are the major financiers in the Indian renewable energy sector. Lenders have concerns with regard to debt recovery and the legal enforceability of claims in India. The cost of debt finance in India is 13-14% and the disputed debt to be recovered is ` 2 Trillion. The debt –equity ratio in renewable energy projects are 70:30. The debt finance required for solar projects alone in 2013 was ` 60 Billion.

9) IEA-RETD, Business Models For Renewable Energy In The Built Environment (2012)

The report provides an insight into the way new and innovative business models can stimulate renewable energy technologies and energy efficiency. The report identifies various barriers which prevent an increased deployment of renewable energy technologies. The barriers include market and social barriers, information barriers, regulatory barriers and financial barriers. The report defines “business model” as “a strategy to invest in renewable energy technology which creates value and leads to an increased penetration of renewable energy technology in the energy sector”.

10) Institute For Building Efficiency, Financing Models For Energy Efficiency And Renewable Energy In Existing Buildings

The report provides a summary of several financial models in use for energy efficiency and renewable energy projects. The study analyses various financing models in use today and those with greatest potential for growth in future.

11) Sustainable Energy Regulation and Policy Making Training Manual: Financing Options For Renewable Energy And Energy Efficiency

The report examines what kind of laws, policies, regulations and incentives could better facilitate or convince these financial institutions to actively participate and support the renewable energy sector in Africa.

12) CPI-ISB, Meeting India’s Renewable Energy Targets: The Financing Challenge (December 2012)

The rapid progress in wind energy and ambitious goals set by the National Action Plan for Climate Change (NAPCC) raise the questions regarding the sources and costs of investment that will be needed to install and operate the renewable energy infrastructure in India. Interviews with investors suggest that the major problem today is the less attractive nature of debt finance in India. The general Indian financial market conditions are the main cause of high interest rates for renewable energy. The report also states that being a growing economy India has competing investment needs and which also contributes to the financial challenges.

13) WISE, Achieving 12% Green Electricity By 2017 (June 2011)

The study discusses the evolution of policy environment for renewables in India. Various barriers such as financial, policy, regulatory, institutional and human resources barriers are identified. The report also lays down the road map of actions needed such as planning, financing, policy, regulation, capacity building, human resources etc.

14) APP Project REDG-06-09: Identifying Optimal Legal Frameworks For Renewable Energy In India (November 2008)

The report provides a fundamental and basic understanding of India's legal system and energy market. It also discusses the existing national energy laws and regulating bodies. It further discusses the existing renewable energy laws and policies at the national level and state level. The report discusses the proposed national renewable energy law by WISE. The report emphasizes on the need for a national renewable energy law. It gives the outline of two types of commonly used laws for renewable energy. The quota system and the pricing system and compares the both.

15) GIZ, Legal Framework for Renewable Energy: Policy Analysis For 15 Developing And Emerging Countries

A theoretical overview of the existing renewable energy support instruments is provided in this document. The report analyses the spread sheet data and provides analysis. The report has adopted 'policy design cycle' originating from the scientific approach of "theory based policy analysis", a scientific approach developed under the European Union Project AID-EE.

The policy design cycle defines pragmatic categories for consistency and effectiveness of RE support schemes in different national contexts, following policy makers to derive concrete action out of a complex set of influencing factors.

16) Deepa Badrinarayana, India's Constitutional Challenge: A Less Visible Climate Change Catastrophe,(2010)

India has taken the stand that it cannot be equitably required to accept legal obligations on climate change given its economic problems and its historically low contribution to the climate change problem. The author suggests that the current position of the Indian government needs to be reviewed, and will, it is hoped be reviewed in the negotiations to revise the Kyoto protocol for the period beyond 2012 in the light of the climate change induced catastrophes that would directly deprive many Indians their right to life and livelihood.

17) World Bank, Doing Business 2014: Understanding Regulations for small and medium size enterprises (2014)

Doing business 2014 is the 11th in a series of annual reports that enhance business activity and those constrain it. The World Bank report compares the business regulations for domestic firms in 189 economies. The report through case studies analyses why the minimum capital requirements are a concern for entrepreneurs. The report analyses the regulatory and procedural aspects with regards to starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency.

18) Earnest & Young India, India Attractiveness Survey 2014 (July 2013)

The report analyses the key features of India's attractiveness in doing business in India. The report suggests that in order to attract more FDI, India needs to improve its operating environment, and of concern are complex taxation system and stringent FDI regulations

19) Review: OECD Multilateral Agreement on Investment and why it never happened

This review attempts to identify the reasons behind the failure of OECD MAI. There is now an undeniable need for universal hard law on foreign direct investment since the system of BITs excludes potential investment relationships which potentially could contribute to a more equal distribution of wealth in the world. Also, the disappointment of the sympathizers of the investment liberalisation was surely one of the factors contributing to the launch of MAI negotiations. The latter, surely was to become to be a great influence to the drafting process of MAI which was initiated in these circumstances.

20) Frank Furt School-UNEP Centre, Global Trends In Renewable Energy Investments 2013

The report focus is on the evolution policies to support renewables investment in European Union, United States and emerging markets. It also discusses overall energy trends, technical costs, subsidies etc.

a) Policy Documents

21) Government Of India, Prime Ministers Council On Climate Change, National Action Plan On Climate Change (NAPCC)

The national action plan hinges on the development of new technologies. NAPCC identifies measures that promote the development objectives while yielding co-benefits for addressing climate change effectively. It outlines a number of steps to simultaneously advance India's development and climate change related objectives of adaptation and mitigation.

b) Articles

22) Needed: A Renewable Energy Law For India, G M Pillai

The Author emphasizes the importance of bringing a comprehensive renewable energy law. The target of 15% by 2020 set by the NAPCC requires that we will have to add close to 90000 MW of renewable power (Wind, Solar, Biomass and Small Hydro combined) by 2020, over and above the 16817 MW installed as of March 2010. Even if we take a flat average, this would mean that for the next ten years, we have to add 9000 MW of R.E. power every year. This is a monumental task for which our human resource sector, our banking and financial sector, our manufacturing sector, our electric utilities and other institutions are not yet prepared. All-round activities will have to be launched on a war footing to achieve this national target. Legal empowerment through an R.E. law will go a long way in facilitating this much desired gradual transition to a sustainable energy system.

23) The Role of BITs in the Law of Foreign Investment, Marvin Rowe

Author describes the advantages and disadvantages of Bilateral Investment Treaties (BIT). The advantages of BITs are many for both developing and developed nations. One fundamental advantage, especially for developing nations, is the improved credibility gained by standing out as a cooperative international actor, receptive to FI and the responsibilities that accompany it.

The large increase in BITs has been accompanied by a whopping five-fold increase inFI in a mere ten-year period from 1990 to 2000. Arguably, FI raises wages, results in new technologies and techniques, improves quality control and management skills, and improves access to markets for export. BITs also served as a solution to the conflicting doctrines of the developed and developing nations that came about after the colonial era. By entering into BITs with developed nations, developing nations not only gain strength in the relationship but they may improve internal governance and rule of law, the theory being that by signing a BIT, developing nations not only prevent themselves from acting in an abusive manner towards FIs but, as a byproduct, such action also leads to less abuse of their own citizens.

BITs create substantive rights for FIs, which translates into substantial obligations and risks for governments, including increased risk of litigation, the potential for ‘ultimate liability’ and the sacrifice of ‘sovereign immunity’. This loss of sovereignty over national investment disputes is hard for many developing countries to swallow. For example, the US-Hondura BIT was delayed for several years in the 1980s because of the loss of sovereignty issue, with the Honduras refusing to sign in 1984, even though by signing they would receive $5 billion in US investment.

24) Jurisdiction and Applicable Law Clauses: where does a Tribunal find the principal norms applicable to the case before it?, Lorand Bartels

It is not uncommon, particularly in investment disputes, for a tribunal to be asked to resolve a ‘dispute’ without any further reference to the norms to be applied by the tribunal. In these cases, the principal norms applicable to the case will be found in a relevant applicable law clause, such as Article 38(1) of the International Court of Justice (ICJ) Statute or Article 42(1) of the International Centre for Settlement of Investment Disputes (ICSID) Convention, which purport to instruct tribunals on the norms.

25) Renewable Energy policies and Barries, Frederick.

The Article discusses various barriers including, cost and pricing, subsidy to competing fuels, high initial capital costs, difficulty in fuel price risk assessment, unfavourable power pricing rules, environmental externalities, transaction costs, lack of legal framework, lack of access to credit, lack of technical and commercial skills etc.

26) Souvik Sen & Sourav Ganguly, Opportunities, barriers and issues with renewable energy development – A discussion, 69 Renew. Sustain. Energy Rev. 1170–1181 (2017)

This paper explore the opportunities, barriers and related issues in relation to renewable energy development in the context of present scenario. By present scenario the authors mean technological advancements happening in the renewable energy sector, improved understanding of renewable energy knowledge, policies promoting renewable energy and renewable energy forms are developing by meeting energy demands in a much cleaner way. The authors approach energy as a strategic commodity. The authors emphasis that "Sustainable socio economic development needs secure energy supplies in an affordable rate which have low environmental impacts and low Greenhouse gas emissions."

The authors conclude by saying that renewable energy policies cannot perform at its best without other ancillary and related areas like land use, agriculture, water, food security, employment, transportation etc. also have policies which support renewable energy. This may create some sort of tradeoff between various sectors resulting in either a win-win situation or win lose situation. So a comprehensive policy taking care of all these is the need of the hour. The authors also suggest that to mitigate climate change and increase the renewable energy production there shall be a “structural shift in today's energy systems.” They are envisaging a world energy system with renewable energy and Energy Efficiency playing a prominent role.

27) Akash Kumar Shukla et al., Solar PV and BIPV system: Barrier, challenges and policy recommendation in India, 82 Renew. Sustain. Energy Rev. 3314–3322 (2018)

The article discuss solar PV and building integrated PV adoption in India. It identifies various barriers for adoption of solar energy and suggest policy measures for change.

2.2 RESEARCH GAP

Many researchers have approached the law for renewable energy as a piece of legislation to fix a favorable tariff and to enable competition in the market. To achieve an optimum level of renewable energy generation, the potential capacity needs to be exploited by an optimum investment in the sector. There are various barriers to for investors which can be addressed by a comprehensive legislation to promote renewable energy. The perception of the investors about the sector is thus very crucial to understand the requirements of a facilitating legal framework.

The Objective of the Electricity Act 2003 is clear from its preamble which intends to develop the electricity sector through environment friendly policies and measures. Though this mandate is crucial for the development of the sustainable energy technologies, the Act has only section 86(1)(e) which directs the state commission to adopt appropriate measures. The irony is that, all hurdles in the development of renewable energy also stems from the same provision. This is a mandate to the state electricity commissions, where all other agencies and government bodies are outside the scope of it.

The researcher examines the Electricity Act 2003 from two primary perspectives. One from the perspective of human rights aspect of access to energy and the other from the economic perspective of development. This examination will reveal whether the Act is brought forth for meeting any one of the objectives or both. Critique of a human rights document from business perspective wouldn't be a justifiable and balanced approach.

Jeslin Drusila Nesamalar, P. Venkatesh & S. Charles Raja also suggested in their article that there is lack of comprehensive approach to promote renewable energy, inconsistency in policy measures, and inaction beyond bringing policy measures, in the state of Tamilnadu. According to **Tedd Moya Mose**, the lack of harmonized international renewable energy law creates the need for an International Energy law overarching all sources of energy. This is true and the central government shall assume responsibility for bringing the laws and policies which can be in harmony with international energy law. Since Solar energy has evolved as the global leader in renewable technologies, the laws shall focus on promoting the same.

Sunil Luthra et al, have identified 28 barriers for the development of the adoption of renewable or sustainable energy Technologies in the Indian context and rank the identified barriers based on analytic hierarchy process. The survey conducted by **Sudhakar Reddy & J. P. Painuly,** among households, personal belong to industry and commercial establishments, and policy Experts reveals how the consumers perceive information regarding renewable energy technology and make decisions using there limited understanding. This gives an insight into the stakeholder's mind from the perspective of a consumer but lacks the finest nuances of an investor's perspective.

As discussed above, researchers have identified barriers and promoters of renewable energy deployment in India. This research is an attempt to classify those barriers and promoting factors which are already identified into those influencing an investment decision negatively or positively. This thesis will endeavor to understand the legal environment for business and the investors mind regarding investing in solar energy for both commercial and domestic purposes. The research also tries to understand which factors are highly influential in the decision making and propose changes in the legal environment based on the understanding of those factors which can be altered by law.

2.3 RESEARCH METHODOLOGY

There will be a library-based research to review the existing literature. There after the socio-legal research methodology is used to conduct a survey in which practitioners, investors, academicians etc will be interviewed. The questionnaire will be designed understanding the problem and basic standards for potential solutions, after the literature review and library-based research.

The Engineering Procurement and Construction (EPC) Contractors[121] play a major role in the development of solar business. There are individuals and companies involved in the business of setting up solar plants and most these ventures identify themselves as EPC contractors. They approach domestic, commercial and industrial customers and convince them to install solar plants. These EPC contractors do their business by coordinating with various stake holders in the sector and are at the center of these transactions. They interact with hundreds of their customers convincing them to install solar power modules. They can provide the filtered and consolidated opinion as to the factors which would convince anyone to invest in solar energy. They can appropriately represent hundreds of customers who have decided to invest in solar and those whom they have failed to convince to do business. I have taken EPC contractors as proxy for investors in the sector as each EPC contractor represents the more reliable opinion of hundreds of real investors.

The research takes the following course of actions:

i) In-depth analysis of primary sources such as existing legislation, investment contracts, and judgments by various adjudicating bodies.
ii) In-depth analysis of secondary sources such as books, articles, newspaper reports, policy papers, conference papers, and published statistics.
iii) To gain further information, several discussion groups, blogs etc. will be monitored

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[121] SOLAR MANGO, EPC DIRECTORY (2017), http://www.solarmango.com/rooftop-guide/India_Solar_EPC_Directory_from_Solar_Mango_Edition_2017.pdf (Accessed 1 Mar. 2018).

iv) Sending questionnaire to persons and organizations in the field of renewable energy, climate change and investments

v) In-depth interviews with specialist lawyers, as well as energy companies, domestic & commercial investors and academicians.

vi) Conducting an emailed survey among EPC contractors to identify and classify factors promoting and detracting investments on the level of its influence over investment decision in solar sector.

2.4 RESEARCH QUESTIONS

The Research Question: Is there an optimal legal framework to promote investments in renewable energy sector in India?

A. Whether the Electricity Act 2003 has been successful in attracting investors to the renewable energy sector in India?

B. What other legislations complement the growth of the sector by promoting investments?

C. Are there legislations that dissuade otherwise potential investors in the sector?

D. Whether the structural changes to the Electricity Act 2003 will achieve the desired objectives?

E. Vision 2047: How the sector is expected to perform under an improved framework of the Electricity Act 2003?

2.5 RESEARCH OBJECTIVES

The Objective of the study is to identify the gaps in the existing legal framework for the comprehensive development of the sector with special reference to the Electricity Act 2003.

A. To study whether the Electricity Act 2003 is making sufficient payoffs to attract investors to renewable energy sector in India.

B. To identify and evaluate the laws that are complementing the growth of the sector by promoting investments

C. To analyze laws those are acting as a barrier to investors in the sector.

D. To study whether the structural changes could achieve the desired objectives.

E. To study the implications on the sector if the Electricity Act 2003 had not been implemented.

F. To study how the sector will perform under the present Electricity Act 2003 in the future.

G. To assess the impact if the provisions of the Electricity Act 2003 were modified or a separate comprehensive legislation brought into existence.

2.6 HYPOTHESIS

Hypothesis: India lacks an optimal legal framework to promote investments in renewable energy sector.

2.7 LIMITATIONS OF THE STUDY

There are many renewable energy sources. Some sources are used to produce bio-fuels while some are used to create electricity. This study focuses on renewable electricity. Renewable Electricity in India is produced mainly from wind and solar. Wind energy do not have a nationwide potential for generation. The states like Tamil Nadu, which has high wind energy potential has already adopted measures for the promotion of the same. Solar Energy on the other hand is available across all states.

Considering the universal nature of solar energy and the potential to be the future of our energy resources, the research is focused on solar energy investment and the regulatory framework dealing with solar in India.

2.8 ARRANGEMENT OF CHAPTERS

The thesis chapters are arranged for discussion of various aspects of the enquiry and addressing various research questions in the following manner.

2.8.1 CHAPTER 1: INTRODUCTION

Introduction to the Thesis. The chapter sets out the research problem, hypothesis, and literature review.

2.8.2 CHAPTER 2: REVIEW OF LITERATURE

A detailed review of literature has helped to identify the research gap. Many researchers have approached the law for renewable energy as a piece of legislation to fix a favorable tariff and to enable competition in the market. To achieve an optimum level of renewable energy generation, the potential capacity needs to be exploited by an optimum investment in the sector. There are various barriers to for investors which can be addressed by a comprehensive legislation to promote renewable energy.

2.8.3 CHAPTER 3: ACCESS TO ENERGY AND THE ELECTRICITY ACT 2003

This chapter examines the constitutional background of the Electricity Act 2003[122]. The chapter will explore the fundamental rights concerning various essential amenities of life, the constitutional mandate under the Directive Principles of State Policy and the center- state relations concerning the division of various legislative powers. After analyzing the constitutional background, the chapter will try to explore the competing claims where the state is under obligation to provide clean and cheaper energy with the sustainability attributes and also ensure equitable distribution of the resources of the nation. The chapter also examines how the Electricity Act 2003 can meet the demand for energy by ensuring an adequate supply of energy throughout the year and also for future generations. According to neo-classical economic theories, the optimum utilization of resources is possible only by bringing competition to the market. Competition in the market is possible only when there are private players in the market. Private players will be interested in investments in the electricity sector only if there is a level playing field with already existing government players and the sector is profitable. This chapter thus examines the attractiveness of the sector under the current regulation under the Electricity Act 2003.

[122] Act 38 of 2003

The objective of the chapter is to identify various advantages and shortcomings from a legal perspective in the existing regulations under the Electricity Act 2003. This chapter examines the constitutional provisions and various court judgments regarding electricity, access to electricity, and the division of legislative power between the states and center. It details the regulatory mechanism for electricity.

2.8.4 CHAPTER 4: LEGISLATIONS COMPLEMENTING THE GROWTH OF THE SECTOR

The growth of renewable energy sector depends on various other legislation in addition to the Electricity Act 2003. This chapter will explore the business environment in India based on the ease of doing parameters adopted by the World Bank. These other legislations, regulations and policies have a direct or indirect impact on the promotion and development of renewable energy sector. The first part of this chapter analyses the general business environment in India which will impact any business activity including the renewable energy sector. The second part of this chapter will examine how the central state government policies and measures have helped the renewable energy sector, especially solar.

2.8.5 CHAPTER 5: BARRIERS TO RENEWABLE ENERGY DEVELOPMENT

India has adopted a comprehensive approach to energy security which is set out in the proposed energy policy[123]. The policy is ambitious of achieving the huge energy targets in the future through the proposed energy mix. The proposed energy mix envisages to have a major role to be played buy the renewable energy technologies. But there are various barriers to be removed for the government to achieve the ambitious energy targets. The barriers to development of RE in India, in general, are described in this chapter. A careful review of existing literature by eminent scholars in the area have identified various barriers to renewable energy development. The scholars have adopted various methods of study to identify various barriers. This chapter is an

[123] *supra* note 5 NITI Aayog.

enquiry into various such barriers. Some of these may be specific to a technology, while some may be specific to a policy, site or a region.

2.8.6 CHAPTER 6: THE STRUCTURAL ANALYSIS OF THE RENEWABLE ELECTRICITY SECTOR AND INVESTMENT DECISION

The investment decision situation is broken into its elements using a framework developed with inspiration from the Institutional Analysis and Development framework. The elements are identified and the key actors, the investors are approached for a survey through questionnaire. The survey has helped to identify the main detractors and the main promoting measures for renewable energy.

The method of study is inspired from various frameworks suggested by various authors including the Institutional Analysis and Development framework developed by Nobel Laureate late Dr. Elinor Ostrom. According to the framework used in the study, the action situation is deconstructed into various elements influencing the decision making. Here the investment decision by a developer is considered for the study. The framework is used to identify all the factors which are having an impact on the investment decision and to understand those factors which can be modified through formal law. The factors which affects the decision can be broadly classified as those which can be changed by rules and those which cannot be changed by rules. The researcher propose to identify the intensity and impact of a factor on the decision making process and propose changes through formal rules.

2.8.7 CHAPTER 7: THE CONCLUSION

The research questions are answered and the Hypothesis is tested. Conclusions and suggestions from the research will be set out with further area for future research.

2.9 CONCLUSION

This study examines the current law and policy affecting the renewable energy deployment in India. The focus of law and policy to promote renewable energy is at the point of market access. But we should make the investment and regulations regarding accumulation of funds and investments more investor friendly to attract investments in the sector. Most of these studies and proposed legal frameworks are limited to the creation of a market access for renewable energy once it is generated. There are a lot more hurdles and barriers an investor may have to overcome to take the benefit of the markets created through quota or pricing regulations. An analysis of Electricity Act 2003 which is the regulating legislation will help to identify the shortcomings in the regulation.

CHAPTER 3

ACCESS TO ENERGY AND THE ELECTRICITY ACT, 2003

3.1 INTRODUCTION

This chapter examines the constitutional background of the Electricity Act 2003[124] (The 2003 Act). The chapter will explore the fundamental rights concerning various essential amenities of life, the constitutional mandate under the Directive Principles of State Policy and the center- state relations concerning the division of various legislative powers. After analyzing the constitutional background, the chapter will try to explore the competing claims where the state is under obligation to provide clean and cheaper energy with the sustainability attributes and also ensure equitable distribution of the resources of the nation. The chapter also examines how the Electricity Act 2003 can meet the demand for energy by ensuring an adequate supply of energy throughout the year and also for future generations. According to neo-classical economic theories, the optimum utilization of resources is possible only by bringing competition to the market. Competition in the market is possible only when there are private players in the market. Private players will be interested in investments in the electricity sector only if there is a level playing field with already existing government players and the sector is profitable. This chapter thus examines the attractiveness of the sector under the current regulation under the 2003 Act.

The objective of the chapter is to identify various advantages and shortcomings from a legal perspective in the existing regulations under the Electricity Act 2003. This chapter examines the constitutional provisions and various court judgments regarding electricity, access to electricity, and the division of

[124] *supra* note 122 ELECTRICITY ACT.

legislative power between the states and center. It details the regulatory mechanism for electricity.

3.2 THE ELECTRICITY ACT 2003 AND THE CONSTITUTION OF INDIA

The constitutional provisions can be classified into rights, duties and powers based on its impact on the Electricity Act 2003. Constitution has conferred rights upon the citizens concerning access to energy, living conditions and environment. It also has conferred various economic rights such as the right to do business, right for equitable distribution of resources et cetera. The Directive Principles of State Policy mandates the state to adopt specific policy measures through legislation for the best interest of the nation. The federal structure of the government provides for distribution of the legislative powers between the center and the state governments.

3.2.1 CONSTITUTION OF INDIA AND BASIC HUMAN RIGHTS

Indian Constitution is one of the largest written constitutions in the world. Indian constitution is also revered globally as a great human rights document. Though the rights for electricity are not clearly written in the provisions of the constitution, various rights embodied there will make the right to energy a right without which the enjoyment of other rights will become futile.

3.2.1.1 Right to Live with Human Dignity

The Supreme Court of India has taken a grand step by expanding the scope of Article 21 beyond the administration of criminal justice through various landmark judgments. The court stated that life in Article 21 does not mean merely animal existence but living with human dignity. In *Francis Coralie v. Administrator, Union Territory of Delhi*[125], the Supreme Court observed that "the right to life includes the right to live with human dignity and all that goes along with it[126]." The court also stated that "the magnitude and content of the components of this right would depend upon the extent of the economic

[125] AIR 1981 SC 746, 753

[126] *Id.*

development of the country" and includes "such functions and activities as to constitute the bare minimum expression of the human self."

3.2.1.2 Right to Shelter

In *State of Karnataka v. Narasimhamurthy*[127], the court held that right to shelter is a fundamental right under Article 19(1) of the Constitution of India. In *Chameli Singh v. State of Uttar Pradesh*[128] the court explained the constituent elements of right to shelter and stated that "Right to shelter, therefore, includes adequate living space, safe and decent structure, clean and decent surroundings, sufficient light, pure air and water, electricity, sanitation and other civic amenities like roads, etc." Court through the above judgment has recognized that electricity is fundamental to the enjoyment of a dignified life and constitutes part of the right to shelter.

3.2.1.3 The right of Access to Electricity

In the matter of *TM Prakash and Others v The District Collector and The Superintending Engineer, Tamil Nadu Electricity Board*[129] the Madras High Court has held that "access to electricity supply should also be considered as part of the right to life in terms ofArticle 21 of the Constitution". Court also observed that "lack of Electricity supply is one of the determinative factors, affecting education, health, cause for economic disparity and consequently, inequality in the society, leading to poverty."

In *Chottelal Yadav v Chattisgarh State Power Distribution Company Ltd*[130] the court has held that "Access to Electricity should be construed as a human right, of course, to the requirements to be satisfied under the Electricity laws. Denial of the same, upon even satisfying the requirements, would amount to a violation of human rights."

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[127] AIR1996 SC 90.

[128] AIR 1996 SC 1051.

[129] MANU/TN/2091/2013.

[130] Chottelal Yadav v Chattisgarh State Power Distribution Company Ltd, W.P.(C)Nos.3341.

3.2.2 CONSTITUTION AND OTHER FUNDAMENTAL RIGHTS

The constitution of India has set out individual as well as collective rights which a citizen as well as in certain cases any person can enjoy. Some of these rights suggesting the need for deploying sustainable energy technology for the benefit all are discussed here.

3.2.2.1 Right to Clean Environment

India is one of the first nations in the world to enshrine environmental protection as a state goal in the constitution. The constitution of India envisages a clean environment. The Supreme Court has extended the application of Article 21 for the wellbeing of the society as a whole recognizing that the individual rights can be enjoyed in the presence of other vital aspects such as a clean environment, which affects the entire population in a geographical area. The two principles governing environment are (i) the principle of sustainable development and (ii) precautionary principle[131]. The right to a healthy environment is an internationally recognized essential for a quality life. The Supreme Court has also accepted the Doctrine of Public Trust[132]. It stated that 'the State is a trustee, and the general public the beneficiary of natural resources.'[133] In *State of MP v Kedia Leather & Liquor Ltd.*[134], The Supreme Court said that 'right to live with human dignity becomes illusory in the absence of humane and healthy environment.'

Court also held that the government should exercise its discretion under various legislations concerning the environment, subject to international conventions to which it has acceded to at the international arena[135]. In *M.C. Mehta v Union of India (2003)*[136] court has expressed its concern on

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[131] M. P. JAIN, INDIAN CONSTITUTIONAL LAW 44-5 (2014).

[132] *Id.*

[133] M C Mehta v Kamal Nath (1997) 1 SCC 388

[134] (2003) 7 SCC 389.

[135] T. N. GovardhanThirumulpad v. Union of India, (2002) 10 SCC 606.

[136] (2003) 10 SCC 389.

vehicular pollution from the burning of fuels with high Sulphur and high benzene content and the emission of greenhouse gases causing climate change.

In *Vellore Citizens Welfare Forum v. Union of India*[137], the Court observed that "the Precautionary Principle" and "the Polluter Pays Principle" adopted into the Indian environmental jurisprudence are essential features of "Sustainable Development" and necessary to achieve “Intergenerational Equity.”

3.2.3 INTERNATIONAL COMMITMENTS FOR PROTECTION OF ENVIRONMENT

The Declaration of the 1972 Stockholm conference[138] has articulated the importance of environment in development. The Supreme Court of India in its judgment on *Essar oil Limited v HalarUtkarshSamiti, and Ors.*[139] hasobserved that the Stockholm Declaration is the Magna Carta of our environment. In 1987, the Brundtland Report, ‘Our Common Environment’ stimulated debate on development and environment again. The World Commission on Environment and Development' propounded concept of sustainable development, which very aptly and comprehensively defined it as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

The United Nations Conference on Environment and Development, informally known as “The Earth Summit,” was held in Rio de Janeiro in 1992. The conference provided the fundamental principles for achieving sustainable development[140]. The Principle, 3 of the conference, recognizes the right to develop to ‘equitably meet developmental and environmental needs of the present and future generations’ while Principle 4 states that ‘environmental protection shall constitute an integral part of the development process to achieve sustainable development, and cannot be considered in isolation from

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[137] (1996) 5 SCC 647.

[138] U.N. GENERAL ASSEMBLY, UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT, (Dec. 15, 1972), A/RES/2994.

[139] MANU/SC/0037/2004.

[140] 1992 Rio Declaration on Environment and Development, 31 ILM 874 (1992).

it[141]. Principle 1 declares that human beings 'are entitled to a healthy and productive life in harmony with nature.'

The obstacles to achieving the sustainable development objectives laid down in the Rio conference was evaluated in the World Summit on Sustainable Development held in Johannesburg in 2002. The United Nations Conference on Sustainable Development in Rio de Janeiro has resulted in the creation of Sustainable Development Goals (SDGs) in 2012 with the objective of creating a set of universal goals that can address the urgent challenges of the world[142].

While the global focus is moved from the Millennium Development Goals (MDGs) to SDGs, the achievements of the MDGs have boosted the confidence of the UN to adopt a more comprehensive SDGs. MDGs were successful in achieving targets like lifting more than 1 billion people out of extreme poverty, reduce child mortality, education for children and reduction in HIV infections[143].

The United Nations has adopted Sustainable Development Goals in its seventieth session on 25th September 2015[144]. In the preamble to the resolution titled- Transforming Our World: the 2030 Agenda for Sustainable Development, it is stated that the Agenda is a plan of action for people, planet, and prosperity. It has announced 17 Sustainable Development Goals and 169 targets. These goals and targets are expected to stimulate actions over the next 15 years in areas of critical importance to humanity and the planet. The Resolution further states that "We are determined to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfill their potential in dignity and equality and a healthy environment."

The UN has set out a 'supremely ambitious and transformational vision' envisaging a world 'free of poverty, hunger, disease, and want.' It also

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141 *Id.*

142 U.N.D.P., BACKGROUND OF THE SUSTAINABLE DEVELOPMENT GOALS (2018) http://www.undp.org/content/undp/en/home/sustainable-development-goals/background/

143 *Id.*

144 UNITED NATIONS, TRANSFORMING OUR WORLD: THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT (2015).

envisages a world where “there is universal access to affordable, reliable and sustainable energy.”

3.2.4 SUSTAINABLE DEVELOPMENT GOALS

The United Nations have revised and improvised the Millennium Development Goals by including new entries like climate change, economic inequality and sustainable consumption. It has created the new list of Global Goals known as the Sustainable Development Goals (SDGs)[145]. The following are the seventeen Sustainable Development Goals.

Goal 1. End poverty in all its forms everywhere

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3. Ensure healthy lives and promote well-being for all at all ages

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5. Achieve gender equality and empower all women and girls

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10. Reduce inequality within and among countries

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12. Ensure sustainable consumption and production patterns

Goal 13. Take urgent action to combat climate change and its impacts

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145 *supra* note 142 U.N.D.P.

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Goal 7 focuses on ensuring 'access to affordable, reliable, sustainable and modern energy for all.' However, a closer look at other goals will reveal the critical fact that the achievement of all other goals depends on the way we create and consume energy[146]. Whether it is ending poverty, providing quality education, removing economic disparity or combating climate change, it all has the energy consumption as one core aspect[147]. The availability of clean, affordable and reliable modern energy is so critically important that without which most of the other goals may remain unattainable.

3.2.5 GOAL 7 TARGETS

The SDGs came into force from January 2016 and has clear targets to achieve by 2030. UNDP the lead agency for the implementation of the SDGs has their presence in 170 countries and territories through the participation of government agencies, private players and civil society[148].

By 2030, ensure universal access to affordable, reliable and modern energy services

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146 U.N.D.P., ENERGISING HUMAN DEVELOPMENT-HUMAN DEVELOPMENT REPORTS (2016), http://hdr.undp.org/en/content/energising-human-development, (last accessed 17 November 2018).

147 *supra* note 142 U.N.D.P.

148 *Id.*

By 2030, increase substantially the share of renewable energy in the global energy mix

By 2030, double the global rate of improvement in energy efficiency

By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular, least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

The government of India thus has international commitment to achieve these targets outlined in the SDGs. UNDP also suggest the mobilization of resources from the private sector will be crucial to achieve these development targets.

3.2.6 ELECTRICITY ACT 2003 AND THE RIGHT TO CARRY ON ECONOMIC ACTIVITIES

The Electricity sector, once considered as a government monopoly was privatized and liberalized through the enactment of Electricity Act, 2003. It is essential to consider the freedoms guaranteed under the Constitution of India to carry on various economic activities. The 2003 Act and the freedom of economic activities envisaged under it shall agree with the constitutional freedoms and restrictions.

3.2.6.1 Right to Carry on Economic Activities

Article 19(1)(g) of the Constitution of India[149] guarantees to all citizens the right to practice any profession or to carry on any occupation, trade or

[149] Article 19(1)(g) in The Constitution Of India 1949, (g) to practice any profession, or to carry on any occupation, trade or business

business. The state is empowered to bring in reasonable restriction on the basis ofthe interest of the general public[150].

Historically India believed in a controlled economy. The government had a Monopoly over various economic activities. Electricity sector was entirely under the Monopoly of State Electricity Boards. The constitutional provisions under Directive Principles of State Policy also promoted the philosophy of regulated control and planned economy to minimize the concentration of economic resources in few hands. The 44th Amendment of the Constitution in the year 1978, has inserted the word socialist into the Preamble to the constitution. The 44th Amendment of the constitution gave the central government unequivocal power to go against private investors and bring various business activities and astringent regulation or government monopoly. In *Excel Wear v Union of India,*[151] the court recognized private ownership of industries and their rights and rights of various stakeholders dealing with such private entities. Art. 19 (6) (ii) enable the state to make laws for creating state monopolies. It is difficult to take any objection if the state is carrying on any business as a monopoly.

The Electricity Act 2003 is in that respect and enabling legislation which has created competition in the sector by allowing private participation and investment in the electricity sector[152]. It has brought to an end the age-old

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[150] Article 19(6) Nothing in sub clause (g) of the said clause shall affect the operation of any existing law in so far as it imposes, or prevent the State from making any law imposing, in the interests of the general public, reasonable restrictions on the exercise of the right conferred by the said sub clause, and, in particular, nothing in the said sub clause shall affect the operation of any existing law in so far as it relates to, or prevent the State from making any law relating to,

(i) the professional or technical qualifications necessary for practicing any profession or carrying on any occupation, trade or business, or

(ii) the carrying on by the State, or by a corporation owned or controlled by the State, of any trade, business, industry or service, whether to the exclusion, complete or partial, of citizens or otherwise.

[151] AIR 1979 SC 25.

[152] See Preamble to the Electricity Act 2003 which reads as follows:

An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalisation of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

monopoly enjoyed by the State Electricity Board in the sector. The Act also protects the interest of the investor by assuring the private players through its provisions creating a level playing field.

3.2.7 THE DUTY OF THE STATE

The state must protect the environment as well as ensure a dignified life to its subjects. Article 48A of the Indian Constitution states that 'the state shall endeavor to protect and improve the environment and to safeguard the forest and wildlife of the country[153].' Delhi has recently witnessed alarming levels of air pollution which will have lasting implications in the health of the people living there. Government has tried various measures like the odd-evenrule[154] to reduce the air pollution, but it has deteriorated every year[155] due to vehicular emissions, factories, constructions and burning of agricultural stubbles in the neighboring states[156], though some of the studies have suggested this as a bold move from the government which has resulted in the reduction of Particulate Matter (PM) in the air[157]. The Supreme Court has reiterated the duty of the government to adopt measures to protect the environment in *Arjun Gopal and Ors. v Union of India and Ors*158 while considering the pollution caused by Diwali celebrations in Delhi and whether any direction can be issued to ban it.

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153 See Article 48A in The Constitution Of India which reads as follows:
Article 48A. Protection and improvement of environment and safeguarding of forests and wild life. The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country

154 GOVERNMENT OF NATIONAL CAPITAL TERRITORY OF DELHI NOTIFICATION NO.F.3 (218)/MRTS/Tpt./2015/302 (Dec 28th, 2015) http://it.delhigovt.nic.in/ writereaddata/ egaz20157544.pdf, (last accessed on 19th Nov. 2018)

155 CENTRAL POLLUTION CONTROL BOARD, DELHI ASSESSMENT OF IMPACT OF ODD-EVEN SCHEME ON AIR QUALITY OF DELHI, http://cpcbenvis.nic.in/pdf/CPCB Report on Odd-Even Scheme.pdf (last visited Nov 19, 2018).

156 Keshav Singhania, G P Girish & Nnaemeka Vincent, *Impact of Odd-Even Rationing of Vehicular Movement in Delhi on Air Pollution Levels*, 7(4) LOW CARBON ECONOMY 151–160 (2016), http://www.scirp.org/journal/lce (last visited Nov 19, 2018).

157 ENERGY POLICY INSTITUTE AT THE UNIVERSITY OF CHICAGO, ODD-EVEN PROGRAM: ANALYSIS: A SUMMARY, https://epic.uchicago.edu/sites/default/files/ Odd.Even Pogram Analysis Q&A.pdf (last visited Nov 19, 2018).

158 MANU/SC/1276/2017

3.2.8 THE DUTY OF THE CITIZEN OF INDIA

The Constitution of India has included fundamental duties for its citizens in the constitution. Article 51A (g) which has imposed the fundamental duty on the citizen of India to protect the environment reads as follows:

It shall be the fundamental duty of every citizen of India to protect and improve the natural environment including forest lakes, rivers and wildlife and to have compassion for living creatures.

The Courts in India also has indicated this as one of the paramount duty of the citizen to protect the environment and leave the planet safe for the coming generations[159]. Keeping the planet safe for living and to meet the needs of the current and future generations in a sustainable manner the entire population on this earth shall work in tandem with the same environmental goals and standards.

The Developed world has moved far in the sustainable ways of production, living, and consumption which the developing nations are still reluctant to embrace due to substantial investment requirements. The World Bank, United Nations, and other international and intergovernmental organizations have identified the need of mobilizing the private capital to meet the developmental investments sustainably. Being a country housing 1/6th of the global population, India needs to act in the same direction to save the planet from an environmental disaster. India needs to mobilize investments for the sustainable development of this country. Energy the core feature of human activity today is the key to sustainability. We need to create sustainable energy and ways of sustainable consumption of it.

The government mustbring such policies to ensure the clean environment. The citizen also shares the duty to protect it. However, sometimes the government measures fail to achieve the desired objective as it happened in Diwali in

159 Arjun Gopal and Ors. vs. Union of India (UOI) and Ors. (09.10.2017 - SC) : MANU/SC/1276/2017

Delhi and during the odd-even rule[160]. People flouted these rules in favor of selfish motives.

3.2.9 CONSTITUTION OF INDIA AND DISTRIBUTION OF POWERS

A closer look at the division of power adopted in the Indian Constitution suggests that functions of national importance have been given to the central government and the functions of local interest to the state governments. However, the problem lies in deciding what functions are of national importance and what functions are of local importance.

Article 1 of the constitution of India states that India is a Union of States. However, Supreme Court has pointed out its federal nature in some instances[161]. According to Article 245, the Parliament is empowered to make laws for the whole of India, or a part thereof. A state Legislature is allowed to make laws only for the concerned state.

However, it is important how we prioritize and classify the functions. It is easy to identify specific functions such as defense and foreign affairs as having national importance; it is difficult to prioritize and suggest about electricity sector since it has its significance at the national level and local level.

The pivotal point in the machinery of a working federal constitution is the division of legislative powers between the federal government and the governments of the constituent federal units. The foundations of the federal system of government can be traced back to the Government of India Act, 1935.

3.2.10 CONSTITUTION OF INDIA AND ELECTRICITY

The Constitution of India which has established a quasi-federal governance system in India has vested the legislative powers for some subjects with the

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160 Sumit Sharma et al., ANALYSIS OF ODD-EVEN SCHEME PHASE-II, https://pdfs.semanticscholar.org/6ccc/fe6af7cc7d8247e2b15fbd8a35ce4730c620.pdf (last visited Nov 19, 2018).

161 State of West Bengal v. Committee for Protection of Democratic Rights, West Bengal, AIR 2010 SC 1476 (India Supreme Court 2010)

federation and some with the states. In respect of some other subjects, the power is given to both the Federation and the states[162]. Electricity is a subject listed in the Concurrent List of the Constitution. Therefore, both the Centre and States have the power to legislate and thereby regulate the electricity sector. However, the overall national policy and legislation are controlled and determined by the Central Government whereas the powers of State Governments remain restricted to their respective state territories[163]. In case of any inconsistency between the state and central legislation, Article 254 provides that the central law has the supremacy[164].

The three functional areas thus created by the Constitution of India has thus kept electricity in the third list, the Concurrent List in the Seventh Schedule. Entry 38 of the Concurrent List is Electricity. The entry does not elaborate on the functions falling under it. The sector but comprise of all the activities from generation to consumption of electricity. Thus matters concerning production or generation of electricity, transmission, distribution, and consumption are matters which comes within the legislative competencies of both the states and the center.

The government of India has enacted various legislations in the past concerning electricity, its generation, transmission, and supply, providing a comprehensive legal framework to regulate and promote the sector.

3.2.11 HISTORY OF LEGISLATIONS GOVERNING ELECTRICITY SECTOR

The Indian Electricity Act, 1903 was one of the earliest legislation in the area which has brought significant legislative changes in the history of the electricity sector. This lawwas subsequently reenacted as the Indian Electricity

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162 INDIA CONST. Seventh Schedule, List I contains entries which has the central government has exclusive legislative power, List II has entries with only state government has the power to make the law and List III contains entries where both the center and state are empowered to make law.

163 *supra* note 131 M.P. Jain.

164 INDIA CONST. art. 254.

Act 1910 (hereinafter the 1910 Act). This legislation was made applicable to the whole of India and had an overriding effect on other provincial legislation. The 1910 Act created a basic framework for laying down wires and other works relating to the supply of electricity. It also provided for private licensees for the supply of electricity in a specified area[165].

Major significant year in the history of the electricity sector is 1948. The Electricity (Supply) Act 1948 which regulated distribution and supply of electricity before the 2003 Act came into existence. In 1948 the State Electricity boards were created through The Electricity (Supply) Act 1948. The State Electricity boards had a mandate of rapid electrification of rural India. They utilized The Five Year Plans and the fund allotted under those five-year plans for electrification and creation of the basic structure in rural India.

The general duties of the State Electricity Boards (SEB) include to arrange for the transmission and supply of electricity within the state, control generation distribution and utilization of electricity within the state, collect the data regarding generation, supply and demand[166]. The SEBs also exercised such other functions to carry out the powers and duties provided under the 1948 Act. Those other functions include regulatory and safety measures[167]. The safety and security of the people were given paramount importance, and the court have mentioned it has to be addressed by the government rather than leaving for the court to recommend[168].

Due to excessive politicizing of electricity tariff and resource allocation, the State Electricity boards went into deteriorating condition. This deterioration has stopped the development of the sector and eventually hindering the development of the nation as a whole. Liberalization and globalization have

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165 Anjali Bhide & Carlos Rodríguez Monroy, *Energy poverty: A special focus on energy poverty in India and renewable energy technologies*, 15 Renew. Sustain. Energy Rev. 1057–1066 (2011), https://www.sciencedirect.com/science/article/pii/S1364032110004132 (last visited Jun 13, 2018).

166 The Electricity (Supply) Act, 1948 [Repealed], Sec. 18

167 The Delegated Legislation Provisions (Amendment) Act, 1983 (20 of 1983).

168 G. Sundarrajan Vs. Union of India and Others, Supreme Court, legalcrystal.com/954206

boosted the economic activities and demand for more electricity. However, this state electricity boards incapable of catering to the growing demand. Understanding the situation the central government initiated dialogue with industry to bring reforms in the electricity sector. Meanwhile few States such as Orissa Haryana Andhra Pradesh Karnataka Rajasthan and UP have initiated reforms on their own.

The Electricity Act 2003 replaced the Indian Electricity Act 1910 and The Electricity (Supply) Act 1948. The act of 2003 has brought in a Paradigm shift in the electricity sector in India. The act allowed private participation in the sector and liberalized electricity generation. Section 185 of the 2003 Act has specifically repealed the Electricity (Supply) Act, 1948 (54 of 1948), and the provisions of the Indian Electricity Act, 1910 (9 of 1910), and the Electricity Regulatory Commissions Act, 1998 (14 of 1998).

Private participation in the electricity sector was brought initially with an amendment to the 1948 legislation in the year 1991. The government brought in the significant change of privatization and liberalization in the sector through government notifications which was later incorporatedcomprehensively under the Electricity Act 2003.

To meet the growing need for power demand, the government required more investments, advanced infrastructure, and greater coverage. The samewould not have been possible without channeling private investment into the sector. The Electricity Act 2003 established a regulatory mechanism to Cater to the industry where private players are willing to invest[169].

The electricity act 2003 ended the Monopoly of State Electricity boards buy unbundling those entities into three different companies undertaking the three different roles of power generation, transmission, and distribution.

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[169] Gisèle Schmid, *The development of renewable energy power in India: Which policies have been effective?*, 45 Energy Policy 317–326 (2012), https://www.sciencedirect.com/science/article/pii/S0301421512001565#s0055 (last visited Jun 13, 2018).

With a growing need of encouraging private sector participation in generation, Transmission and distribution the government created regulatory commissions to regulate the sector and fix electricity tariff through establishing regulatory commissions with the enactment of the electricity regulatory commissions act, 1998.

The role of electricity as the central factor for industrialization and modern living standards made it to the top priorities of the governments across the developing countries. During the post independent era, the government was the only capable entity to mobilize substantial human and financial capital to establish a nationwide electric grid. Various international development agencies like the World Bank also supported the state-led development approach in the post-world war period[170].

The oil shocks of the 1970s have fueled the reforms in the electricity sector. The neoliberal political ideologies resulted in the deregulation, privatization, free trade, and unrestricted capital movement in the energy sector as well[171]. It was the 1990s the nation had witnessed economy-wide liberalizations supported by the international financial institutions of IMF and World Bank that have removed all the barriers for the reform[172].

3.2.11.1 Evolution of the Electricity Act 2003

Electricity Act 2003 repudiated all the previous legislation and promised to create a future meeting the demands of the time and came into force on 10th June 2003. The journey of the 2003 Act began with the introduction of the electricity bill, 2001 on 30th August 2001. The believers subsequently referred to the standing committee on energy. This standing committee submitted its

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170 James H. Williams & Navroz K. Dubash, *Asian Electricity Reform in Historical Perspective*, 77(3) PACIFIC AFFAIRS 412, 411–36, https://www.jstor.org/stable/ 40022909 (last visited Nov 23, 2018).

171 *Id* 420.

172 John Cubbin & Jon Stern, *The Impact of Regulatory Governance and Privatization on Electricity Industry Generation Capacity in Developing Economies*, 20 WORLD BANK ECON. REV. 115–141 (2006), https://academic.oup.com/wber/article/20/1/115/1680456 (last visited Nov 23, 2018).

report on 19th December 2002. The Loksabha passed electricity bill 2001 along with amendments suggested by the standing committee on 9th April 2003[173]. Repeal for subsequently passed by Rajya Sabha on 5th May 2003. It has got the assent of the president on 26th May 2003 and was notified in the Gazette of India on 2nd June 2003. All the provisions of the act except section 121 came into force with effect from 10th June 2003. Section 121 of the earth bikini effective from 27th January 2004 along with the amended provisions of the act which was executed by electricity Amendment Act 2003 was further amended in the year 2007, and an amendment bill was introduced in the parliament in 2014.

3.2.11.2 The Structure of the Act

The Act of 2003 has 18 Parts and one schedule. The first part (Part I) deals with preliminary aspects; Part II covers the national electricity policy and plan. Part III contains provisions concerning the generation of electricity. The provisions related to licensing have been provided in Part IV. There are provisions to deal with theft of electricity prescribing penalties. The schedule contains enactment of the States which have been saved from repeal with specific qualifications. The Central Regulatory Commission has been empowered to constitute an advisory committee for any part of the territory to which the Act extends[174].

The State Regulatory Commission can constitute an advisory committee for a whole State or any part thereof. The Act provides for the constitution of a Central Electricity Authority consisting of members nominated by the Central Government. The Central Government makes rules for the purpose of regulation of the generation, transmission and use of energy and generally to carry out the purposes and objects of the Act. In the discharge of their function, the Central Government, as well as State Regulatory Commission, shall be guided by the National Electricity Policy, National Electricity Plan and Tariff Policy published under Sec. 3 of the Act. The Act also enjoins that

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[173] ALOK KUMAR & SUSHANTA K. CHATTERJEE, ELECTRICITY SECTOR IN INDIA: POLICY AND REGULATION (2012), https://books.google.co.in/books?id=PpEqViahEpEC.

[174] *supra* note 122 ELECTRICITY ACT.

the State Electricity Boards will function as State Transmission Utilities[175]. The Act also provides that the Indian Electricity Rules, 1956 shall continue to be in force till alternative regulations under Sec. 53 of the Act are made.

3.2.12 THE BALANCING OF INTERESTS

The Supreme Court of India in its judgment on *Essar oil Limited v Halar Utkarsh Samiti and Others*[176] stated that the aim of the Stockholm declaration is 'to balance economic and social needs on the one hand with environmental considerations on the other.' In *Indian Council for Enviro-Legal Action v. Union of India The Supreme Court*[177], the court has stated about the requirement of having the equilibrium and balance in development and environment as:

> While economic development should not be allowed to take place at the cost of ecology or by causing widespread environmental destruction and violation; at the same time, the necessity to preserve ecology and environment should not hamper economic and other developments. Both development and environment must go hand in hand, in other words, there should not be developed at the cost of environment and vice versa, but there should be development while taking, due care and ensuring the protection of the environment.

3.3 THE ELECTRICITY ACT 2003

Electricity Act 2003 is the legislation with the mandate of electrifying the nation. The preamble[178] to the Act reads as follows:

> An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking

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[175] S. K. CHATTERJEE, S.K. CHATTERJEE'S COMMENTARY ON ELECTRICITY LAWS OF INDIA: THE ELECTRICITY ACT, 2003, AN INSIGHT WITH THE ELECTRICITY RULES, 2005 ALONGWITH THE ELECTRICITY (AMENDMENT) ACT, 2007, ALLIED RULES, REGULATIONS, ORDERS, NOTIFICATIONS, RESOLUTION AND NATIONAL ELECTRICITY POLICY, TARIFF POLICY & STATE REFORMS (2010).

[176] MANU/SC/0037/2004 (India Supreme Court 2004)

[177] 1996 AIR 1446, 1996 SCC (3) 212

[178] PREAMBLE, ELECTRICITY ACT 2003

> measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalisation of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

The preamble suggest that the Act has the objective of consolidating all the legislation governing the sector and also to establish independent regulatory and adjudicating agencies. The Act also aims to enable the government to take measures for the 'development of the electricity industry' and 'promote competition.' The Act also responds to the ground realities of energy poverty and is also for ensuring 'supply of electricity of all areas.' The environmental externalities are also taken into consideration in the preamble itself and thus has stated to promote 'efficient and environmentally benign policies.'

In *GMR Energy Ltd v Government of Karnataka*[179], The state government has directed the petitioners to operate and maintain generating stations owned by them to supply electricity to the state grid to meet the "extraordinary circumstances" of "severe scarcity of electricity" falling under section 11 of the Act. The order and the power of the government to issue such an order was challenged by the petitioners. It was held that to ensure the availability of power and to address the scarcity of electricity the government has the authority to issue such a direction to private investors under the broad mandate of the comprehensively devised Electricity Act 2003.

Though the appellate tribunal has decided in favour of the state government, it is vital that the Electricity Act 2003 shall have clear legislative provisions to address similar situations which may arise in other states as well. The Act shall be amended to mean "extraordinary circumstances" under section 11 to

[179] MANU KA 0200 2010

include “severe scarcity of electricity” or add a new provision to enable the relevant authorities and agencies to meet the scarcity of electricity situations.

Even though the preamble of the Act has very clearly laid down the spirit of the legislation to promote the environmentally benign sources of electricity, the state boards and regulatory commissions have overlooked the noble intentions of the legislature at times by creating unfavourable business conditions for the renewable energy developers[180]. In *Chhattisgarh Biomass Energy Developers Association and Ors. v. Chhattisgarh State Electricity Regulatory Commission*[181], The APTEL has rightly pointed out that while 3 percent of the electricity input being the reasonable wheeling and transmission charges for a biomass plant, the decision of the Chhattisgarh Electricity Regulatory Commission, to levy 6 per cent has defeated the spirit of the legislation. It was also observed by the tribunal that the regulatory commission has to exercise its powers when the PPAs are one-sided and not in conformity with the guidelines of the MNES (now MNRE).

3.3.1 REGULATORY FRAMEWORK FOR ELECTRICITY SECTOR

The Regulatory Mechanism for electricity sector in India is a combination of central and state government legislations, policies and agencies. The institutional framework is detailed out here in the following paragraph of this chapter.

3.3.1.1 The Institutional Regulatory Mechanism

The regulatory mechanism for electricity exists both at the central as well as the state level. There are various institutional and regulatory framework created under the 2003 Act which are carrying out various duties and exercise the regulatory powers. The authorities forming part of this structure consist of the following:

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[180] Chhattisgarh Biomass Energy Developers Association and Ors. vs. Chhattisgarh State Electricity Regulatory Commission, (07.09.2006 - APTEL) : MANU/ET/0041/2006

[181] Chhattisgarh Biomass Energy Developers Association and Ors. vs. Chhattisgarh State Electricity Regulatory Commission, (07.09.2006 - APTEL) : MANU/ET/0041/2006

3.3.1.2 Ministry of Power

The Ministry of Power is the apex body regulating the electricity sector. Ministry of Power became an independent ministry from 2ndJuly 1992. The ministry was earlier known as the Ministry of Energy Sources. Ministry of Power is primarily responsible for the development of electrical energy in India[182].

The Ministry is bestowed with the primary responsibility of creating policy in the field of electricity. The roles and responsibilities of the Ministry of Power are[183]:

1. General Policy in the electric power sector and issues relating to energy policy and coordination thereof. (Details of short, medium and long-term policies in terms of formulation, acceptance, implementation and review of such policies, cutting across sectors, fuels, regions and intra-country and inter-country flows
2. All matters relating to hydro-electric power (except small/mini/micro hydel projects of and below 25 MW capacity) and thermal power and transmission & distribution system network;
3. Research, development and technical assistance relating to hydro-electric and thermal power, transmission system network and distribution systems in the States/UTs;
4. Administration of the Electricity Act, 2003, (36 of 2003), the Energy Conservation Act, 2001 (52 of 2001), the Damodar Valley Corporation Act, 1948 (14 of 1948) and Bhakra Beas Management Board as provided in the Punjab Reorganisation Act, 1966 (31 of 1966).
5. All matters relating to Central Electricity Authority, Central Electricity Board and Central Electricity Regulatory Commission;

   (a) Rural Electrification;

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[182] GOVERNMENT OF INDIA, MINISTRY OF POWER, available at https://powermin.nic.in/

[183] MINISTRY OF POWER, RESPONSIBILITIES, available at https://powermin.nic.in/en/content/responsibilities

(b) Power schemes and issues relating to power supply/ development schemes/ programmes/ decentralized and distributed generation in the States and Union Territories;

6. Matters relating to the following Undertakings/Organizations:-

(a) The Damodar Valley Corporation (DVC)

The Damodar Valley Corporation was created in the year 1948 pursuant the recommendations made by the inquiry committee appointed after the 1947 floods. The corporation is bestowed with the responsibility of developing suitable measures for controlling the wild and erratic Damodar river in the states of Bihar (now Jharkhand and West Bengal)

(b) The Bhakra Beas Management Board (BBMB)

Pursuant to the Indus water treaty between India and Pakistan the waters of Sutlej, Beas and Ravi were allotted exclusively for India. Bhakra Management Board came into existence under section 79 of the Punjab Reorganisation Act, 1966. This was named as Bhakra and Beas Management Board in 1976 with the transfer of the Beas project on completion[184].

(c) National Thermal Power Corporation Limited (NTPC)

National Thermal Power Corporation (NTPC) is the largest power utility in India[185]. The corporation aims to become a 130 GW company by 2032. India depends the corporation to provide majority of its electricity produced in the country through thermal power corporation.

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[184] BHAKRA BEAS MANAGEMENT BOARD FORMATION OF BBMB (2020) available at: https://bbmb.gov.in/formation-of-bbmb.htm (last accessed 1 Mar. 2020).

[185] N.T.P.C., ABOUT US (2020) available at: https://www.ntpc.co.in/en/about-us (last accessed 1 Mar. 2020).

(d) National Hydro-electric Power Corporation Limited;

National Hydro-electric Power Corporation (NHPC) is mandated with the development of Hydro Power throughout India. It has achieved the status of miniratna in the year 2008[186].

(e) Rural Electrification Corporation Limited (REC)

REC is a Navaratna company under the Ministry of Power. Rural electrification is considered as utmost exigency in India where large number of populations depend on agriculture. Rural electrification has played a key role in Indias food security by making agricultural irrigation independent of monsoons[187]. The rural electrification has helped farmers to install water pumps in the fields with lesser operating costs.

(f) North Eastern Electric Power Corporation Limited (NEEPC)

North Eastern Electric Power Corporation Limited is the largest power utility in the north eastern region of India operating since 1976. This is the only corporation in India which own and operate both thermal and hydro power[188].

(g) Power Grid Corporation of India Limited (PGCI)

Power Grid Corporation of India Limited is a Maharatna company under the ministry of Power. It is the Central Transmission Utility (CTU) of India and is also the largest Electric Power Transmission Utility of the country. The corporation is a Listed Company since 2007.

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[186] *Id.*

[187] R.E.C., CORPORATE PROFILE (2020) available at: https://www.recindia.nic.in/corporate-profile (last accessed 1 Mar. 2020).

[188] NORTH EASTERN ELECTRIC POWER CORPORATION LIMITED, COMPANY PROFILE (2020) available at: https://neepco.co.in/about-us/company-profile (last accessed: 1 March 2020).

(h) Power Finance Corporation Limited (PFC)

Power Finance Corporation is a Navaratna Central Public Sector Enterprice since June 2007. With the mandate to play a key role in the infrastructure financing in the power sector, it is the largest NBFC in India. It is the Nodal Agency for development of integrated power development scheme, ultra-mega power projects, and independent transmission projects[189].

(i) Tehri Hydro Development Corporation (THDC)

THDC is a joint venture between Govt. of India and Govt. of Uttar Pradesh with administrative control under the ministry of Power, Government of India. It is registered as a company under the Companies Act 1956. The sole objective of the company is to develop, operate and maintain the 2400 MW Tehri Hydro Electric Project[190].

(j) National Power Training Institute (NPTI)

This is the national apex body for training and human resources development in power sector. More than three lakh professionals have completed training from the institute[191].

(k) Bureau of Energy Efficiency (BEE)

Bureau of Energy Efficiency came into being on 1st March 2002 under the provisions of the Energy Conservation Act 2001. The Energy Conservation Act is aimed at improving energy efficiency standards in India. BEE is the empowered agency to look after the energy efficiency measures in India[192.]

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189 POWER FINANCE CORPORATION, PROFILE available at: https://www.pfcindia.com/Home/VS/4 (last accessed: 1 March 2020).

190 THDC INDIA LTD, ABOUT US (2020) available at: https://www.thdc.co.in/ (last accessed: 1 March 2020).

191 NPTI, ABOUT NPTI, available at https://npti.gov.in/about-npti (last accessed: 1 March 2020).

192 BUREAU OF ENERGY EFFICIENCY, ABOUT BEE (2020) available at: https://beeindia.gov.in/content/about-bee (last accessed: 1 March 2020).

7. All matters concerning energy conservation and energy efficiency pertaining to Power Sector.

The Ministry of Power carryout its functions with the assistance of the following constituent bodies namely[193].

1) Investment Promotion Cell;
2) Administration and Hydroelectric Power;
3) Planning, Co-ordination & Energy Management;
4) Thermal;

8. Systems and External Assistance; and Finance

3.3.1.3 Statutory Bodies

There are various statutory bodies that have been created under the Electricity Act 2003[194]. These authorities carry out various functions and duties bestowed on them. The regulatory experience will be the compound effect of the activities of these regulatory and administrative bodies.

a) Central Electricity Authority
b) The State Electricity Boards
c) Central Electricity Regulatory Commission
d) Electricity Regulatory Commissions of the State
e) Appellate Tribunal for Electricity.

3.3.1.3.1 Central Electricity Authority (CEA)

The Central Electricity Authority (CEA) was established under section 3 of the Electricity (Supply) Act 1948[195]. Section 70 of the Electricity Act 2003 provides for the continuation of the authority under the new regime of the Electricity Act 2003. It also provides for the constitution and functions of the

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[193] MINISTRY OF POWER, UNIT WISE WORK ALLOCATION, https://powermin.nic.in/en/ content/unit-wise-work-allocation-ministry-power-0

[194] See Sections 70, 76, 80 and 82 of the Electricity Act 2003.

[195] Act 54 of 1948

authority[196]. The CEA is primarily responsible for planning and creation of national power policy on behalf of the Central Government. It advises the Ministry of Power on technical and economic matters directly related to the control and management national power resources. Since regulatory powers with respect to hydro generating station vest in the CEA, it governs the entry of new hydro generating stations to all major projects. It sets safety standards and carries out overall technical regulation.

The Chairman of the CEA is the ex-officio secretary to the government of India, and six full-time members of the rank of additional secretary to the government of India representing thermal, hydro, economic and commercial, power systems, planning and grid operation and distribution. It is important to note that there is no member designated for the renewable energy in the highest electricity authority, while there are members for thermal and hydro.
The CEA prepares and notifies the National Electricity Plan in accordance with the National Electricity Policy in every five years. According to the Section 73 of the Electricity Act 2003[197], the CEA has the following functions to perform.

i) Advise the Central Government on formulation of national electricity policy, development of the electricity sector through coordination of planning agencies with the objective of providing reliable and affordable electricity to the nation.

ii) CEA specifies the technical standards for electrical plants and transmission lines and grid connectivity.

iii) The safety standards are specified by the CEA for construction, operation and maintenance of power plants

iv) Specifies the standards for transmission lines' operation and maintenance for grid connectivity.

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[196] See Sec 73, Electricity Act 2003

[197] See Sec 73, Electricity Act 2003

v) CEA specifies the conditions for installation of meters for transmission and supply of electricity

vi) Promote and assist the promotion and augmentation of the electricity system

vii) Skill development of personnel

viii) Advice the central government on any matters related to the electricity sector

ix) Data collection and monitoring the sector regularly to improve conditions relating to cost, efficiency and completion in the sector.

x) Promote research and development of all matters relating to the sector

xi) Carry out or cause to carry out investigations on any of the matters relating to generation, transmission and distribution of electricity.

xii) Advice the state governments or other licensees or generating companies on matters regarding the operation of the systems under their ownership.

xiii) Advice governments and regulatory commissions on technical matters of the sector.

xiv) Any other function as may be provided under the Electricity Act 2003.

It can be observed that the functions does not reflect the requirements for promoting sustainable and clean energy for India. It also does not mention the requirement of the authority to coordinate with the agencies under MNRE.

3.3.1.3.2 State Electricity Boards (SEB)

The State Electricity Boards were constituted by the State Governments in the exercise of powers under the Electricity (Supply) Act, 1948[198]. Section 12 states that the Board shall bea body corporate having perpetual succession and a common seal. The board like any other corporate entity was entitled to hold movable and immovable property in its name and can sue and be sued in its

[198] Sec.5 The Electricity (Supply) Act [Repealed]1948 Act No.54 of 1948

own name[199]. The SEBs have regulatory functions such as the grant of licenses, fixing of terms and conditions, revocation of licenses, etc.

SEBs along with State Governments exercised recommendatory powers regarding. The clearance for captive generating units that require the approval of the Central Electricity Board. The State Electricity Board in coordination with Generating Companies arranged the supply, transmission, and distribution to areas where it was deficient in power. The unbundling was aimed at achieving the objectives[200] of arm's length relation between the state government and the utilities with a view to bring transparency and create space for commericalisation.

According to section 131 of the Electricity Act 2003, the state government shall prepare a scheme of transfer and publish in the official gazette for the transfer of the assets and liabilities of the state electricity boards. Such assets will be vested in the respective state governments and the state governments shall create and transfer the assets to separate generation transmission and distribution companies. The unbundling is expected to achieve operational transparency and arm's length relation between state governments and the utilities.

SEBs also exercised powers in relation to control over generation and distribution operations. The members, officers and other employees of the board were deemed as public servants under the 1948 Act, while acting in pursuance of the provisions of that legislation[201]. The interesting question of whether the officials of the corporations carved out of the SEBs continue to be public servants, even after the coming into the force of the Electricity Act, 2003 or not came up in *V. Srinivasan Vs. Secretary to Tamil Nadu Generation*

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[199] Sec. 12 The Electricity (Supply) Act [Repealed]1948 Act No.54 of 1948

[200] SHEOLI PARGAL, KRISTY MAYER, GOVERNANCE OF INDIAN STATE POWER UTILITIES: AN ONGOING JOURNEY 11 (2014).

[201] V.Srinivasan Vs. Secretary to Tamil Nadu Generation and Distribution Corpn, legalcrystal.com/965220 https://www.legalcrystal.com/case/965220/v-srinivasan-vs-generation-distribution

and Distribution Corpn[202]. After considering the definition of the term "public servant" under section 21 of the Indian Penal Code[203] and section 2(c) of the Prevention of Corruption Act, 1988[204] and section 169 of the 2003 Act, the court has observed the striking departure the 2003 Act has made from the 1948 Act by not including the officers of the new corporations within the purview of the definition under the 2003 Act.

The High Court of Chennai has held in this case that an employee of the electricity corporation which is falling within the definition of Government Company under section 617 of the Companies Act 1956[205], shall be deemed to be a public servant for the purpose of any corruption charges. For other purposes and offences the 2003 Act has clearly defined the term public servant which include the chairperson, members, officers and other employees of the Appellate Tribunal and appropriate commission, secretary of appropriate commission and assessing officer while acting or purporting to act in pursuance of the provisions of the 2003 Act within the meaning of section 21 of the Indian Penal Code, 1860.

The Philosophy behind the legislations are hidden in the mere fact that under the 1948 Act the officers were deemed as the public servant whereas under the 2003 Act the officers of the new corporations carved out of SEBs do not enjoy that status. Thus, the government wanted to make the new corporations as just like any other private entity and wanted to keep it open for competition. This also reflects the fact how the government is now approaching the electricity supply. The government has moved the electricity supply as a sovereign function to a commercial activity. Thus, the new Electricity Act 2003 has cleared the air for a level playing field for private investors. But the officers are not immune to any corruption charges.

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[202] *Id.*

[203] No 45, Acts of Parliament 1860

[204] No.49, Acts of Parliament 1988

[205] No. 1, Acts of Parliament 1956

3.3.1.3.3 Central Electricity Regulatory Commission

The Central Electricity Regulatory Commission (CERC) was initially constituted on 24th July 1998 pursuant to the Electricity Regulatory Commissions Act, 1998[206] (hereinafter the 1998 Act). The central commission along with various State Electricity Regulatory Commissions (SERC) were established with the objective of rationalization of electricity tariff, transparency in subsidies, promotion of policies which are focused on efficiency and environment friendliness. The statements of objects and reasons given in the 1998 Act suggest that the deepening problem of the electricity sector due to the increased demand and shortage of supply can be addressed through the creation of an independent regulator. The independent regulator will be helpful to attract more private investments into the sector.

The Electricity Act 2003 has repealed the 1998 Act vide section 185, but allowed the electricity commissions to continue under the Act, as a body corporate with perpetual succession[207]. The primary functions of the Central Commission are:

a) To regulate the tariff of generating companies owned or controlled by the Central Government

b) To regulate the tariff of generating companies other than those owned or controlled by the Central Government, if such generating companies enter into or otherwise have a composite scheme for generation and sale of electricity in more than one State

c) To regulate the inter-State transmission of electricity including the tariff of the transmission utilities

d) To regulate the inter-State trading of electricity and to aid and advise the Central Government in the formulation of National Electricity Policy and Tariff Policy.

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[206] No. 14, Acts of Parliament 1998

[207] Sec 76, The Electricity Act, 2003, No. 36, Acts of Parliament 2003

The Electricity Act 2003 has been acknowledged scholars as a significant revolutionary step in the Indian electricity market. It has liberalized the power market. The role of the Central Electricity Regulatory Commission (CERC)[208].

The CERC endeavours to improve the electricity transmission systems through mechanisms like Availability Based Tariff (ABT) and Indian Electricity Grid Code (IEGC). It also facilitate open access in interstate transmission and interstate trading. Other major role CERC play in the electricity market is to advise the central and state governments regarding the entry and exit of market players and removal of barriers to entry and exit[209].

3.3.1.3.4 State Electricity Regulatory Commission (SERC)

The State Governments are empowered to establish an Electricity Regulatory Commission of State as a body corporate with perpetual succession. These Commissions have been allowed to continue under the Electricity Act, 2003. The Regulatory Commissions have been set up in more than 20 States and is expected that other States will follow suit. The primary functions of the SERC are:

a) To determine the tariff for electricity, wholesale, bulk, retail
b) To determine the tariff payable for use by the transmission facilities
c) To regulate the power purchase and procurement process of distribution licensees
d) To promote competition, efficiency, and economy in the activities of the electricity industries and discharge such other functions assigned to the State Electricity Regulatory Commissions under the Electricity Act, 2003.

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[208] DLA Piper, RENEWABLE ENERGY IN THE ASIA PACIFIC: A LEGAL OVERVIEW (3rd ed. 2014).

[209] CENTRAL ELECTRICITY REGULATORY COMMISSION, MISSION, http://www.cercind.gov.in/Mission.html (last visited Nov 26, 2018).

3.3.1.3.5 Appellate Tribunal for Electricity

The Appellate Tribunal for Electricity (APTEL) was established vide section 110 of the Electricity Act 2003. The tribunal is authorized to hear appeals against the orders of the adjudicating officer or the appropriate commission under the Act, 2003. A bench of the APTEL may consist of minimum two members with at least one judicial member and one technical member each[210]. The Chairperson of the APTEL shall be a Judge of the Supreme Court or Chief Justice of a high court. The Judicial member of the APTEL shall be a judge of the High Court or qualified to be one. Technical member shall be a person who has been a Secretary for at least one year dealing with economic and infrastructure matters in any of the department or ministry of central government[211].

The critical question of whether CERC can cap trading margins through regulation was raised in *Ptc India Ltd. Vs. Central Electricity Regulatory Commission Thr. Secy.*[212] It also raised other vital issues such as whether the APTEL has the jurisdiction to examine the validity of Central Electricity Regulatory Commission (Fixation of Trading Margin) Regulations, 2006 (2006 Regulation) and whether the APTEL has the power of judicial review under section 121 of the 2003 Act.

On the issue of judicial review of 2006 regulations by APTEL, the Supreme Court held that the tribunal cannot exercise any power of judicial review of the 2006 regulations under section 121 of the Electricity Act 2003.

The supreme court of India in *Ptc India Ltd. Vs. Central Electricity Regulatory Commission Thr. Secy.,*[213] observed that the powers of the central commission to make regulations provided under section 178 of the 2003 Act is broader in scope than the regulatory functions enlisted under section 79 (1) of the Act.

[210] Sec 112 (b), Electricity Act 2003

[211] Sec 113 (b), Electricity Act 2003

[212] Ptc India Ltd. Vs. Central Electricity Regulatory Commission Thr. Secy, https://www.legalcrystal.com/case/842307/ptc-india-ltd-vs-electricity-regulatory

[213] *Id.*

The regulations are placed before the parliament and is a subordinate legislation while the duties under section 79 is discharged by orders. A regulation under section 178 is part of the regulatory framework and can override existing contracts between regulated entities. Section 178 gives authority of delegated legislation and its validity can be tested only by a judicial review by the court under Art.226 and not by the tribunal. Supreme Court has further stated that section 121 of the 2003 Act does not confer the powers of judicial review on the APTEL. The APTEL has the jurisdiction to hear matters regarding a dispute arising out of the adjudication or interpretation of a regulation made under section 178 through an appeal preferred before it. But it cannot review the validity of the regulation itself.

3.3.2 REGULATORY FRAMEWORK FOR RENEWABLE ENERGY UNDER ELECTRICITY ACT 2003

The Electricity Act 2003 provides for regulatory interventions for the promotion of renewable energy (RE) sources. It has adopted a regulatory mechanism which can cater for the needs of a new technology or energy solution. The regulatory measures and administrative mechanisms envisaged in the 2003 Act generally applies for all types of electricity sources. In addition to the general provisions and measures, the 2003 Act has provided for special treatment to RE through:

a) Determination of tariff;
b) Specifying renewable purchase obligation (RPO);
c) Facilitating grid connectivity; and
d) Promotion of development of the market.

3.3.2.1 Electricity Act 2003 and the Renewable Energy

There are various provisions in the Electricity Act 2003 which directly or indirectly promotes the development of the renewable electricity sector. All those provisions and its pros and cons from the perspective of the renewable energy investment is discussed in the following paragraphs.

3.3.2.1.1 National Electricity Policy and Tariff Policy, Sections 3(1)

Section 3 (1) of the Electricity Act 2003[214] provides that the central government shall prepare a National Electricity Policy and Tariff Policy in consultation with the Central Electricity Authority and state governments. The government is also mandated to ensure the optimal utilization of resources including renewable sources while making such policy. The central government shall also revise the policy from time to time. The Central Electricity Authority shall prepare a National Electricity Plan for the implementation of the national electricity policy.

In *Transmission Corporation of A.P. Vs. Andhra Pradesh State Electricity*[215], the second who is a private electricity generating company applied to the Andhra Pradesh State Electricity Regulatory Commission (APSERC) for sale of surplus electricity due to reduced consumption from the captive facility to the state utility, by way of an enhancement in supply under the already existing power purchase agreement. Also, there existed an order by the commission that directed that the power surplus shall be supplied to state transmission utility or DISCOMs only[216]. The transmission utility, the first appellant, prayed to the commission not to order an increase in the purchase from the respondent.

The second respondent who have established a 6MW biomass cogeneration plant in pursuance of the policy of government of India and policy of the state government of Andhra Pradesh with the objective of selling the surplus in the market. These policies encouraged the private investments in renewable energy.

The order of the commission stating that the surplus energy shall be supplied to the state utility and the unwillingness of the state utility to purchase the

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[214] Sec 3, National Electricity Policy and Plan

[215] Transmission Corporation of A.P. Vs. Andhra Pradesh State Electricity, www.legalcrystal.com/case/52551/transmission-corporation-p-vs-pradesh-electricity

[216] APSERC order dated 20th June, 2001 in O.P. 1075/2000

surplus has created an unfavourable market condition for the renewable energy developer. The commission's order has created barriers to sell electricity under open access and is against the spirits of the 2003 Act and National Electricity Policy.

The APTEL has held that if the power purchase agreements which are one-sided and are not in consonance with the policy guidelines for the promotion of the renewable energy, it is the duty of the appropriate commission to invoke section 86 (1) (e)[217] of the Electricity Act 2003 and make necessary amendments in the power purchase agreements. The commission shall ensure that such amendments would help sustain the operational stability of the renewable energy projects and are in conformity with section 86 (1)(e) and section 61 (h) of the 2003 Act.

In *Citizen Forum Through Its Secretary Shri Rajiv S/O Gajanan Jagtap, Vs. State of Maharashtra Through Its Secretary, Department of Energy (Excluding Non-conventional Energy) and ors*[218]., the High Court of Bombay has observed that appointment of distribution franchisee in pursuance of the 2003 Act and National Electricity policy to promote private participation is valid.

The above-stated cases clearly suggest that the market is still not entirely ready for the competition and the authorities also in some cases not taking necessary steps to implement the pure spirits and objectives of the 2003 Act.

3.3.2.1.2 National Policy for Stand-alone Systems, Section 4

Section 4[219] states that "the Central Government shall, after consultation with the state governments, prepare and notify a national policy, permitting stand-

[217] Sec 86 (1) Functions of State Commission:….(e)promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;

[218] (2008)110BOMLR598; 2008LC(BOM)309, legalcrystal.com/341215 available at https://www.legalcrystal.com/case/341215/citizen-forum-secretary-shri-rajiv-s-o-gajanan-jagtap-vs-maharashtra-conventional

[219] Sec 4, Electricity Act 2003

alone systems (including those based on renewable sources of energy and other non-conventional sources of energy) for rural areas."

In *T. Bhuvaneswariv. District Collector Cum District Magistrate of Erode Dist.*[220], the Chennai High Court has held that the use of the land for erecting towers or poles or drawing lines above it does not amount to acquisition of land and therefore the landowner is entitled for compensation only to the extent of usage of the land by the licensee.

In *R. Santhana Raj vs The Chief Engineer*, the grievance of the petitioner was that the respondent has decided to establish a storage wind farm substation and have made preparations to erect high tension wire linking towers on the lands of petitioner. The petitioners contended on two grounds that is "(i) that the consent of the petitioners as required by Section 12(2) of the Indian Electricity Act, 1910, was not obtained; and (ii) that there is alternative land available in the form of public roads, through which the high tension wires can be carried."

The Madras High Court observed that, even if the prayer for mandamus was allowed by the court, it is still open to the respondents to approach and get an order under section 16 (1) of the Telegraph Act, 1885. If the district magistrate exercise his discretion under the said provision, the power of judicial review is limited over such exercise of discretion. On the other hand if the prayer is refused, the petitioner can approach district magistrate under section 16 (3) of the Telegraph Act, 1885 for sufficient compensation and under section 17 (1) for requiring to remove or alter the line or post to the respondent or under 17 (2) to apply to the District Magistrate to direct the removal.

One of the significant challenges for the rural electrification is the building of network lines for transmission which require to draw electric lines above the lands of multiple owners inviting delay in due to many disputes being raised. Section 4 of the 2003 Act provides for the creation of standalone systems including for non-conventional and renewable systems. This is a motivational

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[220] T.Bhuvaneswari Vs. District Collector Cum District Magistrate of Erode Dist. , https://www.legalcrystal.com/case/1169286/t-bhuvaneswari-vs-collector-magistrate

factor for remote villages to adopt solar powered standalone power plants. This also helps the government to avoid the delay and cost due to litigation in rural electrification.

Promotion of cogeneration and generation of electricity from renewable sources of energy Sections 61, 61(h) and 61(i)

Sections [221] 61, 61(h) and 61(i) state that:

> ..the appropriate commission shall, subject to the provision of this Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the following, namely:-
>
> (h) the promotion of cogeneration and generation of electricity from renewable sources of energy; and
>
> (i) the National Electricity Policy and Tariff Policy.

Section 61 thus creates the framework for fixation of preferential tariff for renewable and non-conventional energy sources. It is the duty of the appropriate commission to adhere to the mandate of this provision and specify the terms and conditions for determination of tariff taking into consideration the promotion and sustainability of the renewable energy sources.

In *Transmission Corporation of Andhra Pradesh Ltd. and Anr. Vs. Sai Renewable Power Pvt. Ltd. and Ors.,*[222] the Andhra Pradesh Electricity Regulatory Commission initiated *suomotu* proceedings for the determination of tariff applicable to the non-conventional energy generation projects of Andhra Pradesh which was to be applicable with effect from 1st April 2004. The commission after hearing the parties fixed the energy purchase at base unit price of ` 2.25 per kW has on 1st April 1994 and the escalation index of 5% p.a. noncompounded. This resulted in a base price of 3.37 per kWhas on 1st April 2004. It was also given that as these power projects has no or

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[221] Electricity Act 2003

[222] Transmission Corporation of Andhra Pradesh Ltd. and anr. Vs. Sai Renewable Power Pvt. Ltd. and ors., https://www.legalcrystal.com/case/842727/transmission-corporation-andhra-pradesh-ltd-vs-renewable-power

minimal variable costs, the tariff will be frozen for a period of five years and will be reviewed thereafter. It also restricted the sale, procurement and distribution of electricity by the developers to only Transmission Corporation of Andhra Pradesh Ltd (APTRANSCO). The order was confirmed again after hearing a review before the commission.

Aggrieved by these orders, the developers filed appeal before the APTEL and the tribunal has allowed the appeal in most of the contentions holding that there is some amount of duress in the power purchase agreements executed with the state transmission utility, APTRANSCO[223].

One of the critical finding of the APTEL was that the APERC has neither the power nor the jurisdiction to compel the developers to sell the power generated by them to APTRANSCO[224].

The Supreme Court held that Andhra Pradesh Electricity Regulatory Commission[225] has the jurisdiction to determine tariff which includes the purchase price for procurement of the electricity generated by the non-conventional energy developers. It further directed the state commission to fix the tariff in accordance with law taking into consideration the particular circumstances of the non-conventional energy developers. They were also directed to re-examine whether it would be feasible to permit sale of generated electricity to third parties, in the larger interest of the state and the public.

Even when the law is clear on the Renewable Energy Purchase Obligations Section 86(1)(e)

Section 86(1)(e)[226] mandates the state commissions to discharge the functions of promotion of “cogeneration and generation of electricity from renewable sources of energy by providing, suitable measures for connectivity with the

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[223] *Id.*

[224] *Id*.

[225] Constituted under sec of the Electricity Regulatory Commission Act 1998 and continuing under sec of the Electricity Act 2003.

[226] Electricity Act 2003

grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution license."

The Tamil Nadu Solar Energy Policy, 2012 was challenged in *Tamil Nadu Electricity Consumers and trade Association (Represented by Its President) and Another Vs. Tamil Nadu Electricity Regulatory Commission, Tidco and Others*[227]. The Tamil Nadu Electricity Regulatory Commission (TNERC) notified the Renewable Energy Purchase Obligation Regulation 2010 making it obligatory for entities under clause 86(1)(e) of the 2003 Act to purchase not less than the specified minimum percentage of its consumption of energy from renewable sources. The regulation was further amended in 2011 to prescribe the minimum quantum of solar energy purchase within the minimum renewable purchase obligation making it compulsory for the obligated entities to meet both the targets. Accordingly, the obligated entities shall purchase not less than 9% of the total annual consumption from the renewable energy sources, of which 0.05% has to be procured from solar energy sources and the remaining 8.95% shall be procured from non-solar renewable sources. In 2011 the commission had reduced the Solar Purchase Obligation (SPO) from 0.15% to 0.05% due to the insufficient availability of solar energy.

In 2012 the government of Tamil Nadu brought into force the Tamil Nadu Solar Energy Policy 2012 and issued policy directive to the TNERC under section 108 of 2003 Act for necessary action. Pursuant to which the TNERC issued its order notifying various procedures for administration of the scheme and notified the obligated consumers. TNERC increased the solar obligation to 3% in 2013 and 6% in 2014 which would require 720 MW and 1500 MW solar energy which was not existing in 2014. The definition of the obligated consumer was also varied in the commission's 2010 regulation and state government regulation of 2012. The state government regulation stipulated

[227] Tamil Nadu Electricity Consumersâandeuro;andtrade; Association (Represented by Its President) and Another Vs. Tamil Nadu Electricity Regulatory Commission, Tidco and Others, https://www.legalcrystal.com/case/1150172/tamil-nadu-electricity-consumers-andeuro-andtrade-association-represented-president-vs-regulatory-commission

High Tension (HT) and Low (Tension) LT commercial consumers as the obligated entities and did not include distribution licensees.

The appellants contended that the state commission has acted under the mistaken belief that the state government directive is binding on them and did not make any independent evaluation of the scheme before implementing.

Tamil Nadu Generation and Distribution Corporation Ltd. (TANGEDCO) contended that the National Tariff Policy prescribed for solar specific RPO to be increased to 3% by 2022. National Electricity Policy also provided for adopting adequate promotional measures for a sustained growth of the renewable energy sources. The state government directives are in line with the national objective and the regulatory commission has the obligation and responsibility to ensure that the regulatory measures also help attain these objectives.

The following vital questions came for consideration:

i) Whether the policy directive issued by the State Government to the State Commission under Section 108 of the Electricity Act, 2003 regarding the implementation of the Solar Policy was binding on the State Commission?

ii) Whether the State Commission was correct in specifying the Solar Purchase Obligation for the HT and LT Commercial category of consumers of the distribution licensee in consonance with the State Governments directive without considering its own Renewable Purchase Obligation Regulations, 2010?

iii) Whether the impugned order regarding Solar Purchase Obligation on some category of consumers of the distribution licensee is discriminatory and is contrary to its Renewable Purchase Obligation Regulations, 2010?

iv) Whether the State Commission could have stipulated the Solar Purchase Obligation consequent upon the policy directive issued by the State Commission u/s 108 independent of exercising the powers vested with the State Commission under Section 86(1)(e) of the 2003 Act?

v) Whether the impugned order has been passed simply to implement the directions of State Government u/s 108 without appreciating the position of law and without application of mind?

The APTEL held that the state commission shall be guided by the directions of the state government under section 108[228] of the 2003 Act to discharge its functions under the 2003 Act but not in a general way outside the functional scope of the state commission. Thus state commission has no power to issue an SPO order as per the directions of the State Government under section 108 in addition and contrary to the RPO obligations mandated in the 2010 regulation of the commission. The commission should not have created two dispensation for RPO, one as per 2010 regulations under section 86 (1) (e)[229] and the other under the policy directive of the state government under section 108.

The Supreme Court of India has held[230] that the state commission is not bound by any policy directions issued by the government under the 2003 Act if such directions if such directions hamper the statutory functions of the commission. The APTEL also has held[231] that the State Commission is independent statutory body. The policy directions by the State Government are not binding on them and curtail the power of the State Commission in the matter of determination of tariff."

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[228] See Sec 108 Directions by State Government: (1) In the discharge of its functions, the State Commission shall be guided by such directions in matters of policy involving public interest as the Central Government may give to it in writing.

(2) If any question arises as to whether any such direction relates to a matter of policy involving public interest, the decision of the State Government thereon shall be final.

[229] See Sec 86(1)(e) (e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;

[230] APTRANSCO vs Sai Renewable Energy Pvt. Ltd.: (2011)11SCC34

[231] Polyplex Corporation vs Uttrakhand Electricity Regulatory Commission in Appeal no. 41,42 and 43 of 2010

There multiple agencies responsible with the regulatory and policy formulation for renewable energy and the lack of coordination and understanding of the functions are raising various barriers in the development of renewable energy.

3.3.3 RENEWABLE ENERGY AGENCIES

There Various Agencies mandated with the responsibility of transforming India into a clean energy nation. At the helm of the affairs is the Ministry of New and Renewable Energy (MNRE), flocked with strong support from National Institute of Solar Energy (NISE), National Institute of Wind Energy (NIWE), Indian Renewable Energy Development Agency (IREDA) and Solar Energy Corporation of India (SECI).

3.3.3.1 Ministry of New and Renewable Energy

The Ministry of New and Renewable Energy (MNRE) is mandated to be the nodal Ministry of the Government of India for matters in the domain of new and renewable energy. The role of the ministry is to develop energy from new and renewable sources of energy to ensure energy security for the nation.

The Commission for Additional Sources of Energy (CASE) was established in 1981 followed by Department of Non-Conventional Energy Sources (DNES) in 1982 and Ministry of Non-Conventional Energy Sources (MNES) in 1992. The Ministry of Non-Conventional Energy Sources (MNES) was renamed in the year 2006 as Ministry of New and Renewable Energy (MNRE).

3.3.3.2 National Institute of Solar Energy

National Institute of Solar Energy (NISE) is created by converting the Solar Energy Centre (SEC) as an autonomous body under the aegis of Ministry of New and Renewable (MNRE), with the mandate to spearhead the National R&D in the field Solar Energy, in the year 2013. NISE coordinates the research in science and technology relating to solar power. Other major responsibility of NISE is to assist the ministry for the implementation of National Solar Mission.

3.3.3.3 National Institute of Wind Energy (NIWE)

National Institute of Wind Energy (NIWE) was established the year 1998 with head office in Chennai, for R&D in the field of wind energy. It seeks to provide solutions for the wind energy sector by carrying out research and development activities for improvements of technology and remove difficulties.

3.3.3.4 The Indian Renewable Energy Development Agency (IREDA)

The Indian Renewable Energy Development Agency (IREDA) is established as a Non-Banking Financial Institution for enhancing the fund flows in the renewable energy sector by providing loans to renewable energy developers at reasonable interest rates. IREDA functions under the administrative controls of the MNRE.

3.3.3.5 Solar Energy Corporation of India (SECI)

Solar Energy Corporation of India (SECI), is incorporated as a non-profit company under Section 25 of Companies Act, 1956, with the administrative control vested at the Ministry of New & Renewable Energy (MNRE). Currently Dr. Anil Kakodkar is the Chairman of the Corporation. SECI is bestowed with the responsibility of implementation of JNNSM Phase-II. It is expected to implement the installation of 3000 MW of power plants in various phases.

3.4 WHETHER THE ELECTRICITY ACT 2003 HAS BEEN SUCCESSFUL IN ATTRACTING THE INVESTORS TO THE RENEWABLE ENERGY SECTOR IN INDIA?

The Energy Crisis of 1970s have made the United States of America to think in terms of renewable and domestic sources of energy. Policymakers encouraged the funding for research on developing ethanol, biodiesel, solar, and wind power. In 1990s, there were major price shocks in oil in US triggering the energy security concerns.[232]

[232] James A. Duffield and Keith Collins, *Evolution of Renewable Energy Policy*, CHOICES (2006), http://www.choicesmagazine.org/2006-1/biofuels/2006-1-02.htm (last visited Nov 28, 2018).

The other major policy push for the renewables was the promotion of rooftop solar installations from the state governments. Attractive schemes of capital subsidies have attracted many investors into the rooftop segment.

The remaining discussion in this chapter will be focused on this central idea of whether the Electricity Act 2003 has been successful in attracting the investors to the renewable energy sector in India.

3.4.1 THE GLOBAL INVESTMENT TREND IN ENERGY SECTOR

Energy business was traditionally in the hands of the state and government institutions due to the considerableinvestment requirement and strategic importance. The entry of renewable energy made energy production and consumption a more localized activity with increased private participation[233]. The energy sector was dominated by big power companies and National Oil Companies. The renewable energy market today has thousands of small companies, NGOs and social businesses which are involved in generation and distribution of renewable energy.

The current energy market is carefully crafted by the government initiatives primarily through the Electricity Act, 2003. The 2003 Act has established a market for the rural electrification to decentralised and distributed generation systems. This has witnessed an acceleration in investments in decentralised generation and distribution of electricity with the active roles and involvement from local self-government, consumer associations, cooperative societies and NGOs. Private investors are also allowed to set up standalone systems in the rural areas.

3.4.2 GLOBAL TRENDS IN INVESTMENTS IN THE ENERGY SECTOR

In the year 2016, the total global investments in the electricity sector has surpassed the oil and gas sector. One of the primary reasons is the 36% drop in two years of oil and gas investments. Even though there was a 5% drop in

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[233] Chandra Bhushan, *Growth of renewable energy in India*, DOWN TO EARTH (2018) https://www.downtoearth.org.in/news/growth-of-renewable-energy-in-india-43605 (last accessed Aug. 30th 2018).

investments in power generation, the 6% increase in investments network assets has balanced out the final investment figures. The overall energy investment has fell 12% in 2016[234]. The primary reason being the drop in the investment in oil and gas sector due to the fall in revenues and oil prices since mid-2014.

In 2017 the global energy investments was at USD 1.8 trillion. The investment in real terms fell by 2% due to lower levels of fossil fuel spending and lower capacity additions in thermal, nuclear and hydropower plants[235].

According to the study conducted by UN Environment Programme and Bloomberg, the renewable energy market makes remarkable progress but not up to the mark[236]. In 2017 the renewables accounted only 12.1% of the electricity produced. This was just 1.1% more than the 2016 status. China, India and Brazil, the big three have accounted for over half of the global investment in renewables, with China alone contributing 45% of the total investment in 2017 and was 35% in 2016.

While China makes progress in leaps and bounds, India has witnessed an increased investment in the energy sector by 7% behind China and United States backed by the strong push by the government to augment the power systems[237].

The fossil fuel investments had a share above 60% in the total energy supply investments since 2000. For the first time, the total share in the fossil fuel investments in the total energy supply investments has dropped below 60% mark. This suggests the shift of focus for energy solutions to the non-fossil fuel sources.

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[234] *supra* note 105 International Energy Agency.

[235] International Energy Agency, WORLD ENERGY INVESTMENT 2018, www.iea.org/t&c/ (last visited Nov 28, 2018).

[236] UN ENVIRONMENT PROGRAMME, GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 2018, https://europa.eu/capacity4dev/unep/documents/global-trends-renewable-energy-investment-2018 (last visited Nov 29, 2018).

[237] *supra* note 105 International Energy Agency.

The drop of fossil fuel and nuclear-based power generation from the 2015 figures amounted to 17%, and this has impacted the worldwide drop of investments in power generation to 5%. The investments in the renewable electricity was also affected during this period due to lesser investments in hydropower. The policy push for solar and wind, uncertain demand outlook,

In OECD region the investments in power generation is 144 trillion USD in renewables, 8 trillion USD in nuclear and 38 trillion USD in thermal power plants. Whereas during the same period in the Non-OECD countries it is 153 trillion USD, 18 trillion USD and 79 trillion USD respectively in the year 2016[238]. In all these figures the investments in the renewable energy sector is much higher than the investments made in the thermal power plants. There is an apparent shift in the focus of energy planning and energy mix towards clean and renewable energy. But the same period the investments in India was still lead by thermal power stations for power generation. The investments in India is 10 trillion USD in Renewables, 3 trillion USD in nuclear and 21 trillion USD in thermal power plants. South East Asia and Middle East also had shown similar trend during the same period with more investments in the thermal power generation than in renewable energy. Both the regions had zero investments in the nuclear power plants in 2016. South East Asia has invested seven trillion USD in renewables and 9 trillion in thermal plants. Middle East has made an investment of one trillion in the renewables and six trillion in thermal plants. China, on the other hand, had made the 90 trillion USD investments in the region out of the total 153 trillion. Their investments in thermal power and nuclear were 34 and 10 trillion USD respectively. While the whole world was moving towards green energy and embracing sustainability and energy efficiency, India is lagging behind and moves in the wrong path with additions being made in thermal power plants[239].

[238] *supra* note 96 UN ENVIRONMENT PROGRAMME.

[239] *supra* note 105 International Energy Agency.

The share of conventional energy including thermal power and fossil fuels rose to 59% in the year 2017 which is has witnessed a marginal increase after 2014 for the first time.

3.4.2.1 World Energy Efficiency Investments

Energy saved is energy generated. The International Energy Agency defines an energy-efficient investment as "the incremental spending on relatively efficient equipment or on building refurbishments that reduce energy use[240]." Compared with 2015 there was an increase of 9% investments in energy efficiency in 2016. This is majorly from investments worldwide in improving energy efficiency by businesses, households and public sector with China showing the fastest growth with 63 trillion USD investments in energy efficiency. The significant investments in the largest sector for energy efficiency, the buildings contributed to the growth of the energy efficient measures. The investments amounting to USD 133 billion in 2016.

China accounted for the sales of most number of Light-Duty Vehicles (LDVs) and Electric Vehicles reflecting a 5% growth in the transport sector. Most of the public spending in energy efficiency was effected through direct grants and tax exemptions.

The overall downward trend of investments in the energy sector in 2017 was reflected in the energy efficiency investments[241]. The sector has witnessed an investment of USD 236 billion which is an increase of 3% compared to the previous year.

Energy Efficiency is an important aspect of Energy Sustainability and the objectives of energy sustainability cannot be achieved if there is no effort which go hand in hand with the clean energy development. Energy saved is energy generated.

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240 *Id.*

241 *supra* note 235 International Energy Agency.

In a recent press note the government of India has stated that “The Asian Development Bank (ADB) and the Government of India on 16th December 2019 signed a $250 million loan to Energy Efficiency Services Limited (EESL) to expand energy efficiency investments in India that will benefit agricultural, residential and institutional consumers. In addition, $46 million financing will be provided from the Clean Technology Fund (CTF), to be administered by ADB[242].”

3.4.2.2 Buildings & Air Conditioning

According to the IEA India will witness a surge in the air conditioner sales in the coming decades. It is expected to grow at 8% per year to 2040. Growing urban population, hot climatic conditions, and the growing income levels will push the growth in this sector adding to the energy demand for the future[243].

The air conditioner sales grew at 6% in the last decade in India, and most of the sales are to the new users making the electricity demand high. The electricity demand boost caused by air conditioners in the year 2016 was more than 10 TWh.

This is where the solar investments in India should match up with. The air-cooling demand and the energy production will be concurrent in the case of air conditioners and solar matching the timing of solar energy production. Using more solar to meet this will help CO2 emissions. The IEA envisages that the output from solar may not catch up with the demand from the air conditioning in India. Also, the cooling demand is high in the evening while the solar output is low. The increase of EER (ratio of output to input energy) from a minimum of 2.7 in 2016 to 3.1 in 2018 through tightening of the efficiency standards for air conditioners in India will help manage the demand side. According to IEA an increased EER of 4 as that of the United States or 5 that

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[242] MINISTRY OF FINANCE, ADB, INDIA SIGN $250 MILLION LOAN TO EXPAND ENERGY EFFICIENCY INVESTMENTS IN INDIA (Dec. 17th 2019) https://pib.gov.in/ newsite/ PrintRelease.aspx?relid=195939.

[243] *supra* note 104 Bloomberg.

of Japan and European Union would avoid 2TWh of demand and 1-2 GW of peak load being added to the system per year[244].

The air conditioner prices are also falling globally due to economies of scale and competition in the market due to an increased demand. IEA in its report states that there is a decline of 16% in the prices on an average in the 47 countries from which they collected the price information[245].

In the year 2016, the number of units of air conditioners sold is 125 million and will consume around 200 to 250 TWh of electricity each year[246]. The new cooling demand accounts for 90TWh,and the rest is consumed by replacement units. The demand addition through the sales of air conditioners will amount to 15% of the annual demand growth in India and many other countries including China. If all the air conditioning units sold in the world had met the Energy Efficiency Ratio of Japan, the additional load demand would have been just 50 TWh instead of 90 TWh.

3.4.2.3 Electricity and Renewables Investment

The year 2016 has witnessed higher spending in the electricity transmission networks and weaker spending in generation. This has resulted in drop of global investments into the sector below USD 720 billion[247]. The reduction of spending in coal-fired plants throughout the world has impacted overall investments in the sector. The period 2015-17 is considered to have achieved the peak in coal power plant investments. The year has also witnessed comparatively lesser investments in the wind power and hydropower additions, and the cost of solar PVs have dropped considerably. The decline of coal power plants in China was a significant incident with slowing down of

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[244] OECD/IEA, TACKLING INVESTMENT CHALLENGES IN POWER GENERATION IN IEA COUNTRIES 1–210 (2007), https://www.iea.org/publications/freepublications/ publication/ tackling_investment.pdf.

[245] *Id.*

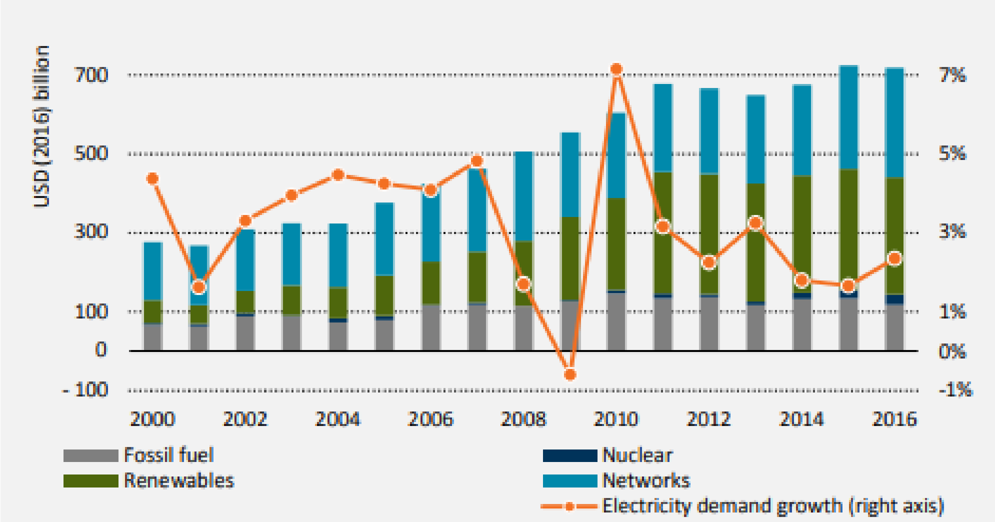
[246] *Id.*

[247] supra note 96 International Energy Agency.

growth of electricity demand over last few years. India, on the other hand, had strong investment trends in coal powered power plants.

In 2017 the global power sector investment fell by 6% to near USD 750 billion[248]. Investments in gas-fired power plants has rose by 40%, though the final investment decision fell by 23% in 2017[249].

Figure 1.12 Global power sector investment and electricity demand growth



Global electricity sector investment edged downward by nearly 1% to under USD 720 billion in 2016, with a decline in generation investment more than offsetting a rise in spending on networks.

Note: 2016 electricity demand growth is estimated, from IEA (2017e) *World Energy Outlook 2017*, forthcoming.

Source: WEO 2017

Fig. 3.1 Global Power Sector Investment and Electricity Demand Growth

According to the IEA statistics, renewable energy accounted for 80% of the total electricity sector investments. This shift from conventional sources to renewables were mainly driven by the policy focus on the renewables, replacement of ageing network assets, digital technologies which enhanced system adequacy and flexibility and access to new consumers.

[248] *supra* note 235 International Energy Agency.

[249] *Id.*

The trend in investment growth in the renewables are in line with growth in the energy demand. The renewable investment in capacity addition 2016 will be able to meet 90% of the demand increase during the same period.

3.4.2.4 Financing and Funding of Electricity Supply Investment

Electricity supply funding is critical to the overall growth of the sector. Various business models and government policies have impacted the way the capital is made available for investment in electricity supply. Companies operating entirelyunder-regulated revenue mechanisms to manage the risks of wholesale price volatility have made 94% of investments in power generation in the year 2016, and the same was 92% in 2011[250]. Twenty destinations in terms of market and technology had contracted pricing to secure long-term cost recovery of assets. The power markets all over the world are mostly dominated by the business model where public utility companies that own and operate the network assets purchase electricity produced by independent power producers (IPPs) at regulated or contracted prices. These mechanisms are responsible for the 50% of the increase in the total installed capacity globally[251].

In the past, most of the investments in the electricity networks were made by independent network operators who relied on regulated tariffs and government entities with administrative investment budget. The business models in distributed generation are on the other hand determined by the retail tariff design. Investments in the sector by unbundled grid companies are stable with replacements of ageing assets and modernization[252]. In 2016 60% of the total investments were made in the single buyer markets by the utilities from the administrative investment budgets. This is an increase from the 2011, where the same was at 50%. The increase of 10% has mainly happened due to the

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[250] *supra* note 105 International Energy Agency.

[251] *Id.*

[252] FRANKFURT SCHOOL-UNEP CENTRE/BNEF, GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 2017 (2018), http://www.fs-unep-centre.org (Frankfurt am Main), http://www.fs-unep-centre.org (last visited Aug 29, 2018).

investments happened in China, India and Southeast Asia. The IEA opines that the role of Public Private Partnership can play a better role in augmenting investments in the sector[253].

The evolving electricity markets are creating more investment opportunities through policy reforms enabling more private players to step in. One key policy challenge faced by all the markets was to innovate a policy design to balance affordability and return on investment in the renewable electricity sector. Policies focused more on ensuring energy supply, though the price indication was low resulting in creation of complex business models which may not be sustainable in the long run. It is important to note that the major investors in the sector such as China, Japan, Mexico and Korea are moving towards competition in the market with wholesale and retail players to have market opportunities[254].

China initiated measures to adopt direct power purchase (DPP) between IPPs and large consumers, and the grid prices will be stabilized through transparency in pricing or fixed prices for DPPs to carryout. China is also making policy changes to augment investments in the distribution sector from the private investors[255].

Japan opened up the market for new entrants through liberalization in the year 2016. Mexico has unbundled the state-owned vertically integrated utilities (VIUs) and introduced a national wholesale market, though the trading is very nascent. Korea has announced that it will unbundle the state-owned VIU and list the subsidiaries in the stock exchange. The subsidiaries will have their investments oriented towards renewables[256].

The renewables are changing the electricity markets impacting the financing of projects. New business models are being introduced and tried to recover the

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[253] *supra* note 105 International Energy Agency.

[254] *supra* note 252 UNEP Centre/BNEF.

[255] *supra* note 105 International Energy Agency.

[256] *supra* note 104 Bloomberg.

costs and to improve efficiency with advanced technology, operation and locations.

Utility-scale investments were made to the tune of 60% of the total investments in the renewable power in 2016. The increased policy support for determining the pricing has helped the sector to achieve this milestone. Majority of the investments are made in the markets where there is a feed-in tariff mechanism adopted through regulated pricing. One-third of the investments were but made in the jurisdictions where contracts were awarded by auctions and independently negotiated power purchase agreements (PPAs). There is an increased level of investment to the extent of 36% of the total utility-scale renewable investment in 2016 through competitive mechanisms compared to 2011 when it was only 28%. This surge is mainly due to the combination of policy mechanisms such as wholesale pricing and renewable certificates which censured a fair remuneration. Though it is a positive signal to see more investments are becoming ready to face the market risks, it is not entirely correct to conclude so. This is mainly because of the subsidies and tax credits which influenced the price discoveries. It is also influenced by fixed-price contracts to drive down the investment risks. It is essential in future the investment models adjust to the changing demand and supply situations.

The conventional power plants are struggling to recover their investment costs in wholesale markets. Renewables have lower marginal costs which are usually covered in the regulated and contracted pricing mechanisms. Some markets are working to enhance the reliability on spot markets to ensure adequate rewards.

Obtaining finances for power generation in wholesale market mechanisms depends on providing incremental revenue streams[257]. These mechanisms include:

i. Contracts for multiple allied services and products such as electricity, heat, steam and compressed air in a locality

[257] Laurie Van Der Burg & Shelagh Whitley, RETHINKING POWER MARKETS: CAPACITY MECHANISMS AND DECARBONISATION (2016).

ii. Tolling agreements where energy input and output are exchanged
iii. Capacity mechanisms to make capacity available to deliver electricity at specific periods.
iv. Provision for grid and ancillary services.

Capacity mechanisms have attracted appreciation from the regulators and policymakers as a mechanism to assure supply during the scarcity period. But the lack of coordination of such measures impacts the price discovery in the wholesale markets. The mechanisms works with the remuneration to generators and demand-side response by-

i. Targeted payments for strategic reserves in tight supply situations as in the markets of Belgium and Sweden
ii. Market-wide payments auctioned by a single central buyer like United Kingdom and the US PJM Interconnection which is an independent system operator (ISO)
iii. Market-wide capacity obligation on suppliers like in France, who can purchase certificates.
iv. Capacity providers receive a fixed payment in exchange for giving up peak prices during scarcity like in US ISO New England

3.4.2.5 Investments in Storage

Grid-scale storage is an important area which need attention to ensure reliable and flexible supply of electricity. The recent growth of technology and decreasing costs have made it an attractive investment option in the sector. The total investments in the storage is as low as 0.4% of network investment in 2016[258]. There are various business models in which storage investments are made. They rely on combination of models that can generate revenues for a project corresponding to the multiple services. Changes in the policy and rules that limited wholesale participation and improved capability of

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[258] INTERNATIONAL RENEWABLE ENERGY AGENCY, GLOBAL ENERGY TRANSFORMATION: A ROADMAP TO 2050 (2018), www.irena.org (last visited Aug 29, 2018).

developers to monetize system services. The primary use of this storage is to provide grid and ancillary services by regulating frequency with demand[259].

There is a considerable growth in the investment in battery and its applications since 2012. The investment has reached above 500 MW in 2016 from a total investment of less than 100 MW capacity in 2012[260]. The main applications of the storage investments include energy demand shifting, demand-side management and microgrids, grid and ancillary services, avoiding network constraints and investments and reliability events. Battery storage is a capital-intensive investment which the regulators are trying to stimulate with long-term contracts and capacity contracts and with centralized competitive auctions and utility procurement obligations[261]. In California, the regulators held an emergency tender in the year 2016 for commissioning 70 MW of grid-scale batteries to manage severe supply constraints due to Aliso Canyon gas storage leak. The investment in battery comes as an immediate response to supply variations and demand pressure.

3.4.2.6 Investments in Power Generation

The investment figures in power generation came down to USD 440 billion which is 5% drop from the previous year. One of the reasons which is attributed for the fall in the prices is the fall in the cost of technologies for generation of power. The below chart shows the comparison of increase investments at the capital cost at the levels of 2010 prices.

Investment in thermal power plants dropped by 12% to USD 117 billion in 2016. The steep slowdown in commissioning of coal power plants in China has resulted in such massive drop. While India recorded a rise in investments in coal-fired power plants offsetting a rise in investment. Even though there was a drop in investment coal remained the third most popular option among

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259 *supra* note 236 UN ENVIRONMENT PROGRAMME.

260 *supra* note 258 Renewable Energy Agency.

261 STATISTA, GLOBAL RENEWABLE ENERGY INDUSTRY-STATISTICS & FACTS, https://www.statista.com/topics/2608/global-renewable-energy-industry/ (last visited Aug 29, 2018).

the countries for power generation investments after solar PV and wind at nearly USD 80 billion investments.

The IEA is of the opinion that, the extent of decline and relatively younger age of existing plants which averages nearly 20 years suggest that the investment in coal power plants have reached its all-time peak in 2015-17. China and Europe have made clear policy shifts not to invest more in new build power plants with coal as fuel.

Investment in gas-fired power plants also dropped to USD 34 billion in 2016 to its lowest level in a decade. While the investments slowed down in China and the Middle East, it has increased in United States, Europe, Southeast Asia and Japan. Oil fired plants also witnessed its lowest investment in 2016 with less than USD 4billion mainly from Middle East, Africa and Latin America.

Unites States and China led the investments in nuclear power plants. Investments in nuclear power were highest in 25 years with United States commissioning the first nuclear plant in the last 20 years. The total investment in nuclear plants have added 10 GW of power capacity to the existing. Though the investment in terms of capacity addition was similar to that of 2015, the higher overnight capital costs in countries like United States have increased the investment figures[262].

The USD 297 billion investment in 2016 is the largest source of electricity investment. Though the figures show a decline of 3% from the previous years. The capacity additions were 50% higher than 2011[263]. The decrease in the investment costs has helped the renewable sector to grow in terms of the capacity addition.

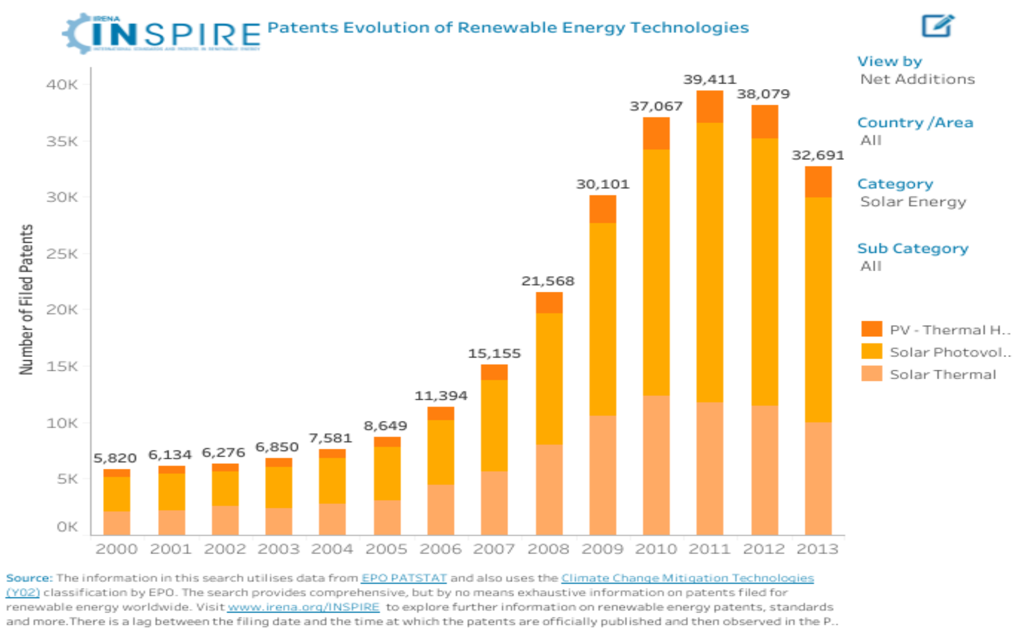
3.4.2.7 Investments in Research and development

Renewable energy technologies are still an evolving segment in the energy sector with improvements in the technology and innovations are continuously

[262] *supra* note 105 International Energy Agency.

[263] *supra* note 258 Renewable Energy Agency.

happening. In an urge to achieve the best technological solution in this quest for future energy solutions, the companies and investors have invested hugely in the R&D. Even though most of the world business community yet to appreciate and endeavour to this business, the ones already here have created considerable amount of knowledge base and technical know-how.



Source: IRENA

Fig. 3.2 Innovations Trend in Renewable Energy

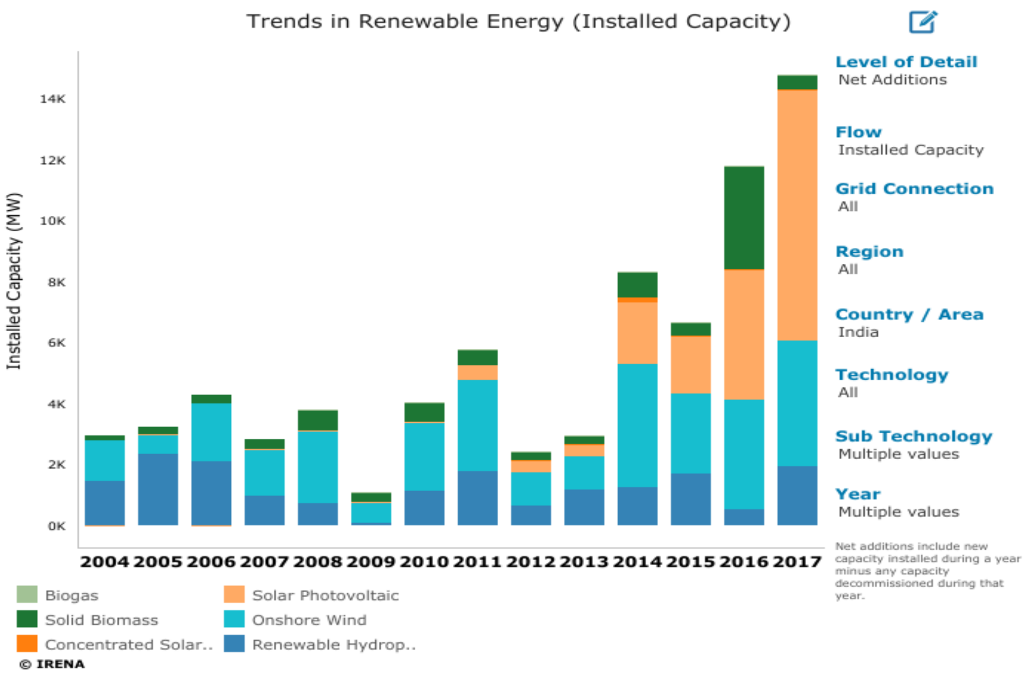
The above figure suggests the global trend of new patents in the renewable energy sector. The trend suggests that there are more and more research and innovation happening in the sector. This is reflective of the fact that the investors are confident in the future possibilities in the sector and ready to spend on the R&D264.

3.4.3 RENEWABLE ENERGY INVESTMENT TRENDS IN INDIA

India has introduced various law and policy measures to increase the capacity addition in the renewable energy sector. In 2004 India has made a capacity

264 *Id.*

addition of 1440 MW in Renewable Hydropower, 1352 MW in onshore wind and 136 MW in biomass energy. The major capacity addition in the solar PV has occurred in the year 2011with a capacity addition of 466MW[265]. The investment has come down to 396 and 360 MW in 2012 and 2013 respectively. The total renewable energy investment also came down to less than 4GW during this period. In the year 2014 onwards the renewable energy capacity addition has picked up and has made considerable growth, though 2015 was a bad year. The total investment in renewable energy touched 8000 MW.



Source: IRENA

Fig. 3.3 Annual Renewable Energy Capacity Addition

The Solar energy has witnessed an exponential growth since then with 4250MW in 2016 and 8226 MW in 2017 in terms of capacity addition[266]. The investment trend shows somewhat consistent investments in the onshore wind and renewable hydro since 2004. This suggests that there existed a consistent

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265 *supra* note 43 CENTRAL STATISTICS OFFICE.

266 *supra* note 258 Renewable Energy Agency.

conducive environment for investments in the sector. Whereas solar energy investments have shot up only since 2014.

There are multiple reasons for the recent growth of the investments in solar energy[267]. They are the growth in the innovation and technological advancements in the sector and the policy push for investments in the sector under various government schemes. In 2017 the investments in renewable power outpaced the investments in fossil fuels based power generation with nearly USD 20 billion. The solar photovoltaic capacity in India has grown from 3GM in 2014 to 22GW in 2018, an eight-fold growth[268]. The recalibrated highly ambitious renewable energy target of 175GW by 2022 can be achieved with more aggressive investments in the sector.

The Ministry of New and Renewable Energy, Government of India, has come up with the latest policy document[269] which suggest the establishment of Wind-Solar hybrid projects. The policy also propose for AC and DC integration into the grid. The government entities are allowed under the new policy to invite bid for the hybridization of the current wind and solar power projects.

3.4.4 CONCLUSION

The boost for renewable electricity from solar PV was resulted from the Jawaharlal Nehru National Solar Mission which was launched in 2010. The capacity addition and investment data shows that the growth of the solar energy sector was nor positively or negatively affected by the Electricity Act 2003,even though the lack of coordination of various agencies and the lack of

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267 IRENA, CORPORATE SOURCING OF RENEWABLE ENERGY: MARKET AND INDUSTRY TRENDS (2018), https://www.irena.org/publications/2018/May/Corporate-Sourcing-of-Renewable-Energy (last visited Nov 30, 2018).

268 Kanika Chawla et al., CLEAN ENERGY INVESTMENT TRENDS EVOLVING LANDSCAPE FOR GRID-CONNECTED RENEWABLE ENERGY PROJECTS IN INDIA (2018), http://www.ceew.in/sites/default/files/CEEW-Clean-Energy-Investment-Trends-Report-27Jun18.pdf (last visited Nov 30, 2018).

269 Ministry of New & Renewable Energy, AMENDMENT IN NATIONAL WIND-SOLAR HYBRID POLICY, https://static.investindia.gov.in/s3fs-public/2018-09/%28Amendment %29 %2B National Hybrid wind solar policy_0.pdf (last visited Nov 30, 2018).

importance given to it by various state government policies and commissions has curtailed its growth in many states. The need for additional policy push and promotion for investments required to be relooked at since it does not offer consistency. The way forward is to incorporate the consistent policy measures in the legislation to enhance growth in the sector.

The Electricity Act 2003 has laid down a comprehensive legal framework to ensure and protect the investors. In addition to the general framework for regulating the sector and creating a conducive environment for investment; the act has included general provisions which may be helpful to promote and protect investors in the renewable energy sector. Since those provisions were enacted at a time when the renewable energy industry was at an infant stage, and many of the complexities of the sector were unknown to the lawmakers, it is expedient to have a more specific legislation instilling confidence in the investors.

Since we can find from the detailed discussion of the legal provisions that, there need a more coordinated mechanism at the national level is required to improve investment conditions. Some of the measures adopted by the government entities and regulators are discouraging the investors. It is essential to understand what other laws may be complementing the growth of the sector. The next chapter will discuss the other laws which are affecting investments in the sector.

CHAPTER 4

LAWS COMPLEMENTING THE GROWTH OF RENEWABLE ENERGY

4.1 INTRODUCTION

The growth of renewable energy sector depends on various other legislation in addition to the Electricity Act 2003. This chapter will explore the business environment in India based on the ease of doing parameters adopted by the World Bank. These other legislations, regulations and policies have a direct or indirect impact on the promotion and development of renewable energy sector. The first part of this chapter analyses the general business environment in India which will impact any business activity including the renewable energy sector. The second part of this chapter will examine how the central state government policies and measures have helped the renewable energy sector, especially solar.

4.2 EASE OF DOING BUSINESS IN INDIA

Ease of doing business is an annual report published by the World Bank after evaluating the ease of doing business in every nation by 10 parameters. Commencing from the year 2003 the report has achieved an overwhelming response from various countries by adopting such measures to improve the ease of doing business score[270].

According to the World Bank Report on Ease of Doing Business in India 2019, India stands at 77th Position in ease of doing business. According to World Bank, it is for the first time that India has moved into the top 80 list.

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[270] WORLD BANK GROUP, DOING BUSINESS 2018, 15 CESifo Forum 312 (2017), http://www.worldbank.org/en/news/press-release/2017/10/31/doing-business-2018-fact-sheet-india (last visited Jun 3, 2018).

The report also recognized India as one of the top performers and among the top 10 nations who have made considerable improvements in the last year's assessment. Out of the ten indicators of doing business India has implemented reforms in 8 areas. The total score India achieved in the 2018 doing business report of the World Bank is 60.76 compared to 56.05 in the same period in the year of 2017.

The Department of Industrial Policy and Promotion (DIPP) Under the Ministry of Commerce and Industry along with the World Bank Group, released the Business Reform Action Plan (BRAP) 2017 on 13th April 2017. It had a total of 405 recommendations concerning regulatory processes, policies, practices, and procedures. The 12 major areas which required the Reform include "Labour Regulation enablers, contract enforcement, registering property, inspection reform enablers, single window clearance system, land availability and allotment, construction permit enablers, environmental registration enablers, obtaining utility permits, paying taxes, access to information and transparency enablers and sector specific reforms spanning the life cycle of a typical business[271]." The BRAP was circulated to all the states and Union Territories, and an assessment of implementation of reforms was published on 31st October 2016. The national average stood at 48.93% on implementation of the suggested reforms[272].

The implementation average shows that most of the state governments have not taken the reforms as a priority. This will adversely affect the investment and business environment in the country.

4.2.1 STARTING A BUSINESS

India has merged the application procedure for various tax compliance requirements. The Permanent Account Number (PAN) and the Tax Account Number (TAN) are allotted through a single application. This has reduced the

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[271] MINISTRY OF COMMERCE & INDUSTRY, BUSINESS REFORM ACTION PLAN 2017, http://pib.nic.in/newsite/PrintRelease.aspx?relid=161017 (last visited Jun 4, 2018).

[272] *Id.*

processing time and red-tapism. Some states have also merged the GST registration and professional tax registrations along with the PAN and TAN Registrations.

The ministry of Corporate Affairs, Government of India, has notified Simplified Proforma for Incorporating Company Electronically (spice) on 16th December 2016. The objective of the new form is providing speedy incorporation of companies facilitating ease of doing business in line with international best practices[273].

Spice form replaces multiple application forms and procedures required earlier for obtaining Director Identification Number (DIN), Permanent Account Number (PAN) Tax Account Number (TAN), application for reservation of name and incorporation of new company[274].

India improved starting a business score by merging the applications for the Permanent Account Number (PAN) and the Tax Account Number (TAN) through an improved online process. In Mumbai the application for the value-added tax and the profession tax are also merged to speed up the process[275]. In 2016 report India improved score by eliminating the minimum capital requirement for incorporation the requirement of certificate of commencement of business[276]. Some of the other important changes were made in the year 2015, 2013 and 2011. In 2015 the registration fees were reduced, in 2013 the Companies Act 2013 was introduced and in 2011established online VAT registrations to promote startups.

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273 MCA, SIMPLIFIED PROFORMA FOR INCORPORATING COMPANY ELECTRONICALLY (SPICe), http://pib.nic.in/newsite/PrintRelease.aspx?relid=155584 (last visited Jun 4, 2018).

274 COMPANIES (INCORPORATION) FOURTH AMENDMENT RULES, 2016 (2016), http://www.mca.gov.in/Ministry/pdf/CompaniesIncorporationFourthAmendmentRules_01102016.pdf (last visited Jun 4, 2018).

275 WORLD BANK GROUP, BUSINESS REFORMS MADE IN THE ENFORCING CONTRACTS - DOING BUSINESS, (2018), http://www.doingbusiness.org/reforms/ overview/topic/Enforcing-Contracts (last visited Jun 5, 2018).

276 WORLD BANK, INDIA JUMPS DOING BUSINESS RANKINGS WITH SUSTAINED REFORM FOCUS 2016 (2017), http://www.worldbank.org/en/news/press-release/ 2017/10/ 31/india-jumps-doing-business-rankings-with-sustained-reform-focus (last visited Jun 3, 2018).

4.2.1.1 Dealing with Construction Permits

Obtaining construction permits from the local authorities are always difficult due to rampant corruption and red tapism at the local governments. An online process implemented at the municipalities have streamlined the process avoiding delays and an opportunity for the applicant to track the status of the application. This has considerable reduced the time required to obtain the building permit.

The three Municipal corporations in Delhi, have completed integration with all external agencies through a common application form to eliminate manual applications for building permits. They have also introduced an online automatic calculator for estimation of different charges to be paid[277]. Applicants can now make one single online application too concerned urban local body instead of approaching multiple offices for Obtaining building permits. The new policy enables an applicant to receive approvals within 30 days by reducing human interface[278].

India made dealing with construction permits easierin 2018 through digitalization of processes at the local governing bodies. The online system played a key role in streamlining the process of obtaining building permit. This has reduced the time and cost of obtaing such permits as it has resulted in the reduction of number of procedures[279]. This was an advanced step in this direction after the introduction of strict timelimits for obtaining building permits and preconstruction approvals in 2013[280].

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[277] MINISTRY OF HOUSING & URBAN AFFAIRS, NDMC TO END MANUAL APPLICATIONS FOR BUILDING PERMITS BY MAY 15; MCDS BY MAY END (Apr. 28th 2016), http://pib.nic.in/newsite/mbErel.aspx?relid=142442 (last visited Jun 4, 2018).

[278] MINISTRY OF HOUSING & URBAN AFFAIRS, USER FRIENDLY UNIFIED, SIMPLIFIED BUILDING BYE-LAWS FOR DELHI ANNOUNCED, (Mar. 30th 2016), http://pib.nic.in/newsite/PrintRelease.aspx?relid=138407 (last visited Jun 5, 2018).

[279] *supra* note 270 WORLD BANK.

[280] World Bank Group, DOING BUSINESS 2013 SMARTER REGULATIONS FOR SMALL AND MEDIUM-SIZE ENTERPRISES (2004), www.worldbank.org (last visited Dec 17, 2018).

4.2.2 GETTING ELECTRICITY

Electricity being basic necessity of a dignified life, the government has taken various measures for universal access to electricity[281]. The Government of India and way the state governments have rolled out different schemes to provide electricity to the rural and urban population living without access to electricity.

The schemes for commercial use of electricity are different from that for the domestic use. So the procedure also slightly vary for obtaining electricity force business and commercial activities. The Electricity Act 2003 is one of the earlier legislations in India which has absorbed the principles of a right to timely provision of services to the consumer.

Ease of doing business 2018 has considered the procedures, time and cost required for a business or commercial entity to obtain a permanent electricity connection 4 and newly constructed warehouse. The Other parameters included in the survey are transparency of tariffs, price of electricity and the reliability of supply of electricity. India stands at the 29th position in the world ranking of 190 Nations according to the latest doing business report of 2018. The electricity sector is a star performer for India along with minority investor protection to achieve an improvement in the world rankings and reach the 100th position[282].

India was in the 99th position in this category during 2015. The continuous efforts to reform the electricity sector has made India to improve its ranking to 26 in 2017, which is at 29 in the year 2018. The procedure for obtaining and new connection has been reduced to three procedures such as an online submission of application and conduct of site inspection, demand note

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281 Shashank Bengali, *Inside India's epic effort to bring electricity to millions of people for the first time*, LATIMES (Dec. 29th 2017), http://www.latimes.com/world/la-fg-india-electricity-2017-htmlstory.html (last visited Jun 5, 2018).

282 Sudheer Singh, *How electricity reforms boosted India's stellar performance on Ease of Doing Business, Energy News*, ET ENERGYWORLD (Nov. 1st 2017) , https://energy.economictimes.indiatimes.com/news/power/how-electricity-reforms-boosted-indias-stellar-performance-on-ease-of-doing-business/61401939 (last visited Jun 5, 2018).

generation if required, and the external connection and installation of meter. Electrical connections up to 150 KVA will be provided within 7 days.

In Delhi getting electricity was made faster and cheaper by streamlining the process[283]. The requirement of internal wiring inspection by the Electrical Inspectorate was removed in 2016. The internal work processes and coordination was also improved during this period[284].The security deposit for new connection were slashed in 2015 reducing the cost.

4.2.3 REGISTERING PROPERTY

Entry 18 of a list II, the state list, States that "Land, that is to say, rights in or over land, land tenures including the relation of landlord and tenant, and the collection of rents; transfer and alienation of agricultural land; land improvement and agricultural loans; colonization." Land ownership and the evolution of rights on immovable property has its historical relevance. Land and land rights have been the core of legendary disputes in the courts[285]. Land being a subject for state regulation and complexities involved in land ownership and titles the central government has not been successful inbringing uniform reforms throughout the nation.

There is no uniform Legal procedure and documentation to claim ownership as soon as to prove ownership of land and immovable property[286].

Sale deed is a primary document used in India to establish ownership of immovable property. Other documents which is used to prove ownership include property tax receipts and survey documents. However, these documents does not establish the ownership rights in immovable property

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[283] *supra* note 279 World Bank.

[284] World Bank Group, DOING BUSINESS 2016 MEASURING REGULATORY QUALITY AND EFFICIENCY (2016), www.worldbank.org (last visited Dec 17, 2018).

[285] His Holiness KesavanandaBharatiSripadagalvaru and Ors. v. State of Kerala and Anr. (1973) 4 SCC 225)

[286] WORLD BANK, INDIA LAND POLICIES FOR GROWTH AND POVERTY REDUCTION (Jul 9th 2007), http://siteresources.worldbank.org/INTKNOWLEDGEFORCHA NGE/ Resources/491519-1199818447826/landpoliciesforgrowthandpovertyreduction.pdf (last visited Jun 6, 2018).

conclusively[287]. It is possible that a person holding all this document may still have an inadequate or improper title to the immovable property he claims. This is because the owners of ensuring the proper title to the property of the previous owner vests on the buyer[288]. In most of the cases, due to lack of awareness and multiplicity of procedures and documentation required even educated people failed to verify the previous ownership properly[289]. Land ownership in India is presumptive in nature and can be challenged before the court of law.

The situation has in further worse condition when it comes to the land records maintained by government departments. Until recently all land records relating to immovable property were recorded and maintained in poor state of conditions without updating at the district or village level. These departments work in silos, and the data and information was never synchronised or verified creating multiple layers of data adding to the confusion already created in the mind of the property owner with the multiple documents and procedures.

According to the Doing Business 2018 report, India has not made any progress in the area of registering property is concerned.

4.2.4 GETTING CREDIT

The banking and financial sector in India is regulated by the Reserve Bank of India (RBI). RBI has issued various guidelines and circulars for the banks to follow while functioning in the market. The master circular on priority lending is one such document which lists out some key sectors which the banks shall consider for lending on priority. Priority sector lending suggests to the banks

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[287] FAO, WHY LAND TENURE IS IMPORTANT, http://www.fao.org/docrep/005/y4307e/y4307e04.htm (last visited Jun 6, 2018).

[288] MINISTRY OF RURAL DEVELOPMENT, STANDING COMMITTEE ON RURAL DEVELOPMENT TWENTY SECOND REPORT LOK SABHA SECRETARIAT (2015), http://164.100.47.193/lsscommittee/Rural Development/16_Rural_Development_22.pdf (last visited Jun 6, 2018).

[289] D. C. Wadhwa, *Guaranteeing Title to Land*, 37 ECON. POLIT. WKLY. 4699–4722 (2002), http://www.jstor.org/stable/4412872%5Cnhttp://www.jstor.org/stable/pdfplus/4412872.pdf?acceptTC=true (last visited Jun 6, 2018).

to comply with certain lending norms. The banks are required to meet lending targets in those sectors which are listed in the priority sector[290].

The New Insolvency law has amended the priority of secured creditors outside the reorganization proceedings. The new insolvency law as strengthened the credit market in India.

Doing Business Report 2018suggested that the amendment to the laws making priority of secured creditors outside corporate reorganization proceedings has improved the access to credit ranking[291]. The new Insolvency Code provides for time bound and clear grounds for relief to the automatic stay for secured creditors during reorganization proceedings. The launch of unified and geographically centralized collateral registry to provide credit information has also strengthened the secured transactions system.

4.2.5 PROTECTING MINORITY INVESTORS

India has strong investor protection laws concerning minority investors. The parameter measures the "strength of minority shareholder protections against misuse of corporate assets by directors for their personal gain as well as shareholder rights, governance safeguards and corporate transparency requirements that reduce the risk of abuse[292]." India has been ranked fourth in the world ranking in this parameter due to its strict regulations on investor protection.

The common law principle of majority rule laid down in *Foss v Harbottle*[293] can be traced as the guiding principle in the business freedom allowed to the directors under the Companies Act, 2013. Indian Judiciary also followed the similar philosophy by restricting itself in interfering with shareholders'

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[290] WORLD BANK, India Jumps Doing Business Rankings with Sustained Reform Focus 2016 (2017), http://www.worldbank.org/en/news/press-release/2017/10/31/india-jumps-doing-business-rankings-with-sustained-reform-focus (last visited Jun 3, 2018).

[291] *supra* note 279 WORLD BANK.

[292] WORLD BANK, PROTECTING MINORITY INVESTORS-DOING BUSINESS (2016), http://www.doingbusiness.org/data/exploretopics/protecting-minority-investors (last visited Jun 5, 2018).

[293] *(1843) 67 ER 189*

internal matters as it is evident in *Rajahmundry Electric Supply Corporation v. A. Nageshwara Rao*[294] *and Bagree Cereals v. Hanuman Prasad Bagri*[295]

Chapter XVI of the Companies Act, 2013 deals with protection of minority shareholders. Sections 241 to 246 of the Act, lays down detailed provisions to deal with oppression and mismanagement. To strike the proper balance between the majority rule and minority protection, and to ensure that frivolous complaints are not made against the management of any company, section 244 of the Act lays down the required minimum number of shareholders to sign the application to be filed before the company law tribunal[296]. Section 245 of the Act recognises the novel concept of Class Action suits. Section 245 reads as follows:

Such number of member or members, depositor or depositors or any class of them, as the case may be, as are indicated in sub-section (*2*) may, if they are of the opinion that the management or conduct of the affairs of the company are being conducted in a manner prejudicial to the interests of the company or its members or depositors, file an application before the Tribunal on behalf of the members or depositors for seeking all or any of the following orders, namely:—

(*a*) to restrain the company from committing an act which is *ultra vires* the articles or memorandum of the company;

(*b*) to restrain the company from committing breach of any provision of the company's memorandum or articles;

(*c*) to declare a resolution altering the memorandum or articles of the company as void if the resolution was passed by suppression of material facts or obtained by misstatement to the members or depositors;

(*d*) to restrain the company and its directors from acting on such resolution;

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[294] *1955 SCR (2)1066*

[295] *2001 105 CompCas 465 Cal*

[296] Arunachala Ramaiya & Arvind P. Datar, Guide to the Companies Act (2010).

(*e*) to restrain the company from doing an act which is contrary to the provisions of this Act or any other law for the time being in force;

(*f*) to restrain the company from taking action contrary to any resolution passed by the members;

(*g*) to claim damages or compensation or demand any other suitable action from or against—

(*i*) the company or its directors for any fraudulent, unlawful or wrongful act or omission or conduct or any likely act or omission or conduct on its or their part;

(*ii*) the auditor including audit firm of the company for any improper or misleading statement of particulars made in his audit report or for any fraudulent, unlawful or wrongful act or conduct; or

(*iii*) any expert or advisor or consultant or any other person for any incorrect or misleading statement made to the company or for any fraudulent, unlawful or wrongful act or conduct or any likely act or conduct on his part;

(*h*) to seek any other remedy as the Tribunal may deem fit.

The Act also has provided exit options to the minority shareholders during a merger, or amalgamation vide section 235 and 236 of the Act.

The World Bank has evaluated the following measures as improvements in the area[297]:

The remedies for the minority shareholders were increased in cases of prejudicial transactions between interested parties[298]. Minority investor protections were improved with greater disclosure of conflicts of interest by board members, increasing the remedies available in case of prejudicial related-party transactions.

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[297] *supra* note 290 WORLD BANK.

[298] *supra* note 279 WORLD BANK.

4.2.6 PAYING TAXES

India was host to a complex indirect tax regime. There were multiple taxes ranging from Central and state excise duties taxes on interstate sale of goods intra State sale of goods entry tax on imports into States luxury tax et cetera. The introduction of GST from 1st July 2017 has subsumed most of the complex indirect taxes that over existing at the state and Central level[299]. The incidence of tax is also made simpler as supply of goods or services. India has adopted AC dual GST model where the state government impose state GST and Central Government impose Central GST on a transaction which happens within the state. All interstate transactions are levied by the central government under IGST. The new tax regime has brought paradigm shift in the taxation sector in India. The Indian Constitution was amended to incorporate the dual GST model. There was shift and changes in the taxing powers and the revenue of the center as well as the states under the new regime. Previously Taxes were levied based on origin of the goods or services. This has been shifted to a consumption-based tax system under the GST regime where tax is levied at the place of supply. The major criticism about this taxation regime is that it incentives consumption and not production. The states which are investor friendly and promotes business and manufacture are losers due to the shift of revenue to consumer states.

Tax payment procedures have been now completely computerized and has been made less cumbersome[300]. By adopting some administrative measures India has made corporate income tax compliance easier. The technology enabled taxation regime under GST has played an important role in making the indirect tax experience of taxpayers easy and convenient.

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[299] MINISTRY OF FINANCE, RECOMMENDATIONS REGARDING DATA ANALYTICS MADE DURING THE 26TH MEETING OF THE GST COUNCIL (Mar. 28th 2018), http://www.pib.nic.in/PressReleseDetail.aspx?PRID=1523711 (last visited Jun 5, 2018).

[300] PWC, PAYING TAXES 2018: IN-DEPTH ANALYSIS ON TAX SYSTEMS IN 190 ECONOMIES, https://www.pwc.com/gx/en/services/tax/publications/paying-taxes-2018.html (last visited Jun 5, 2018).

There are three parameters based on which the World Bank assess ease of paying taxes. They are time to comply in hours, the number of payments in a year and the total tax rate. India has head corporate income tax rate of 30 % which is comparatively moderate, and it is proposed to bring down to 25 percent in a phased manner. The number of taxes as far as the income tax and GST are concerned is on par with International standards. The labour taxes comprising of professional tax Employee Provident Fund employee insurance are not on an International standard with multiple payments in a year. The time taken to comply with tax payment is measured in hours. It takes 45 hours to comply with corporate income tax where 91 hours to comply with labor taxes is. The time taken for compliance under GST regime is comparatively lesser.

The reforms in the taxation in the past include making EPF payment electronically and easing the compliance requirement of corporate income tax. The corporate income tax was reduced from 30% to 25% from the financial year 2017-18. Abolition of fringe benefit tax in the year 2011 and the introduction of value added tax in 2012 were some other major reforms India has made in the past.

4.2.7 TRADING ACROSS BORDERS

The World Bank group Asus the cost and time associated with the process involved in exporting and importing goods. It takes into consideration the documentary compliance, border compliance and domestic transport[301].

On July 15, 2014, A committee was constituted by the secretary, Department of Commerce, Government of India To make recommendations for reduction in number of mandatory documents required for exports and imports. The scope of the committee was later expanded to include all the aspects relating to improve the ease of doing business in relation to trading across borders.

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[301] WORLD BANK, METHODOLOGY FOR TRADING ACROSS BORDERS-DOING BUSINESS (2016), http://www.doingbusiness.org/Methodology/trading-across-borders (last visited Jun 5, 2018).

The committee conducted studies on ascertaining the number of documents required time taken and cost involved for exports and imports in India. An inter-ministerial team of officials led by director general of foreign trade visited Jawaharlal Nehru port and interacted with customs officials and Port officials. After the details study and various discussions and deliberations based on the findings, the committee submitted its report Titled " trading across borders- a report on improving ease of doing business in India" in December 2014[302] with actionable recommendations for reducing the number of documents time and cost in the export and import procedures.

The World Bank relied on the feedback received from a survey conducted among 28 participants for calculating the scores for ease of doing business in trading across borders. The DGFT conducted a Survey among 50 participants and compare the result with the scores of ease of doing business report 2015. The table showing the comparison between the DGFT survey with the doing business scores of 2015 is given below:

Table 4.1 Comparison of Findings with Doing Business Data

Country	Export			Import		
	Documents to export (number)	Time to export (days)	Cost to export (US$ per container)	Documents to import (number)	Time to import (days)	Cost to Import (US$ per container)
DGFT Survey Data	6	13	762	7	14	692
Doing Business 2015 Data	7	16	1120	10	20	1250

Source: TRADING ACROSS BORDERS: A Report on Improving "Ease of Doing Business" in India, (2014)

Based on the study, the committee has made recommendations for improving the scores under trading across border. Chapter IV of the report contained the following recommendations for Customs and other related Agencies and Departments.

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302 TRADING ACROSS BORDERS, A REPORT ON IMPROVING "EASE OF DOING BUSINESS" IN INDIA, (2014), http://dgft.gov.in/exim/2000/Trading_Across_Borders.pdf (last visited Jun 5, 2018).

1) Conversion of Non-EDI ports to EDI ports and extension of ICEGATE to sezs
2) Extension of 24 × 7 customs clearance facility for all types of export/Import clearances
3) Enabling of Customs EDI system to accept secure online submission of all Export /Import documents
4) Integration of customs and excise in a common IT platform
5) Implementation of Single Window Project of CBEC
6) Steps for quicker clearance by Regulatory Agencies other than Customs
7) Implementing change of system or examination norms with sufficient notice
8) Implementation of the existing rules for examination of Export Cargo
9) Abolition of stamp duty on delivery orders

Import and export procedures at ports can be a great hurdle for cross-border business. By adopting some measures to ease the procedural lag, India has improved the experience of importers and exporters at various ports. This has reduced the cost of compliance, through digitalization and eliminating merchant overtime fees[303].

The introduction of ICEGATE—an electronic data interchange system in 2008 has made international payments through internet made the cross border trade easier in India. The time for export was reduced considerably through digitalization of data interchange system in the year 2009. The launch of Customs Electronic Commerce Interchange Gateway portal in the year 2017 has reduced the documentary compliance procedure. The improvements in the infrastructures in the ports and airports also have made the international trade and business easier in India.

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[303] *supra* note 270 WORLD BANK

4.2.8 ENFORCING CONTRACTS

The National Judicial Data Grid, introduced recently by the government of India helps to generate case measurement reports on local courts. After measuring the exact procedures used by litigants and courts to evict a tenant for nonpayment of rent and to collect a bounced cheque, in 109 countries the World Bank team has constructed and index of procedural Formalism of dispute resolution for each country[304]. The article suggest that the formal requirements systematically greater in civil law countries then common law countries. It is also associated with higher duration of judicial proceedings, less consistency, less honesty, less wireless in judicial decisions, and more corruption. They have also observed that developing countries are more suffered due to inefficient levels of procedural Formalism which they carry as a legacy of legal transplantation from their colonial rulers.

The methodology takes into account the time taken for filing and service, trial and judgment, and enforcement of the decision. The Other variables which are considered include the cost of litigation covering the average attorney fees Court fees and other related payments made to the court. The quality of judicial process index measures the good practices adopted in the court system in four major areas of court structure and proceedings, case management, courtroom automation and alternative dispute resolution[305].

The Energy sector entirely depends on the efficient enforcement of power purchase agreements. The poor enforcement mechanisms has raised the concerns for an investor regarding the dishonor of power purchase agreements.

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[304] S. Djankov et al., *Courts*, 118 Q. J. ECON. 453–517 (2003), https://academic.oup.com/qje/article-lookup/doi/10.1162/003355303321675437 (last visited Jun 5, 2018).

[305] WORLD BANK, METHODOLOGY FOR ENFORCING CONTRACTS-DOING BUSINESS, http://www.doingbusiness.org/Methodology/Enforcing-Contracts (last visited Jun 5, 2018).

4.2.9 RESOLVING INSOLVENCY

The Insolvency and Bankruptcy Code 2016 is a Landmark legislation which will bring systematic reforms in India's insolvency regime and the quantum leap in the functioning of India's credit market. The historic legislation was passed by Lok Sabha on 5th May 2016 and was subsequently passed 11th May 2016 by the Rajya Sabha.

Prior to the new code, the Indian insolvency landscape was ruled by multiple legislations. The recovery action by creditors work done through the Indian Contract Act 1872 or Transfer of Property Act 1882. There were few special legislation which were enacted during the last century which also did not reduce the peril of the creditor and the lender[306]. These legislations include:

1) Recovery of Debts Due to Banks and Financial Institutions Act, 1993
2) Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest Act, 2002,
3) Sick Industrial Companies (Special Provisions) Act, 1985
4) Companies Act, 1956
5) Presidential Towns Insolvency Act, 1909
6) Provincial Insolvency Act. 1920.

The average time taken by these legislations to resolve insolvency matters in India was about 4.3 years as on 2015. This was much higher compared to advanced economies like United Kingdom and the United States of America where it took only 1 year and 1.5 years respectively. The procedural lags in the court and the lack of clarity on the bankruptcy framework caused much of the delay.

The new code envisages to promote entrepreneurship availability of credit and balance the interests of debtors and creditors. It consolidates all the existing laws relating to reorganization and insolvency resolution of Corporate persons partnership firms and individuals. Another important feature of the new law is

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[306] PRS Blog, *The Insolvency and Bankruptcy Code: All you need to know*, PRS INDIA, http://www.prsindia.org/theprsblog/?p=3642 (last visited Jun 6, 2018).

the maximization of the value of the assets through at time-bound resolution of insolvency disputes[307].

According to the Ministry of Finance, Government of India the salient features of the new insolvency and bankruptcy code are as follows[308]:

i. Clear, coherent and speedy process for early identification of financial distress and resolution of companies and limited liability entities if the underlying business is found to be viable.
ii. Two distinct processes for resolution of individuals, namely- "Fresh Start" and "Insolvency Resolution."
iii. Debt Recovery Tribunal and National Company Law Tribunal to act as Adjudicating Authority and deal with the cases related to insolvency, liquidation and bankruptcy process in respect of individuals and unlimited partnership firms and in respect of companies and limited liabilities entities respectively.
iv. Establishment of an Insolvency and Bankruptcy Board of India to exercise regulatory oversight over insolvency professionals, insolvency professional agencies and information utilities.
v. Insolvency professionals would handle the commercial aspects of insolvency resolution process. Insolvency professional agencies will develop professional standards, code of ethics and be first level regulator for insolvency professionals members leading to development of a competitive industry for such professionals.
vi. Information utilities would collect, collate, authenticate and disseminate financial information to be used in insolvency, liquidation and bankruptcy proceedings.
vii. Enabling provisions to deal with cross-border insolvency.

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307 The Insolvency and Bankruptcy Code, 2015, , http://www.prsindia.org/uploads/media/ Bankruptcy/Insolvency and Bankruptcy code, 2015.pdf (last visited Jun 6, 2018).

308 MINISTRY OF FINANCE, PARLIAMENT PASSES THE INSOLVENCY AND BANKRUPTCY CODE (May 11th, 2016), http://www.pib.nic.in/newsite/ PrintRelease. aspx?relid=145286 (last visited Jun 6, 2018).

Corporate reorganizations were earlier dealt by the provisions of companies Acts enacted from time to time. Today India has a more specific legislation on the subject. The Insolvency Act is an attempt to provide a legal framework to facilitate corporate insolvency. The law helps corporate to reorganize itself and allowing to restructure debts.

4.2.10 LABOR MARKET REGULATION

India has witnessed some important amendments to many of its archaic labor and industrial laws. This has improved the conditions of many industries which were otherwise threatened by the more liberal and employee focused labor laws[309]. Indian Labour Markets are regulated by more than 30 legislation.[310]

A comprehensive Labour Law reform involves substantial reforms in existing legislation, administrative mechanism, and e-governance initiatives to generate job and facilitate ease of doing business. The government envisages Legislative reforms through codification of laws relating to wages, social, security, and welfare, occupational safety, health and working conditions[311].

Based on the recommendations of the second National Commission on labour the existing labour laws will be grouped into four labour codes. They are labour code on wages, code of Industrial Relations, Code of social security & welfare, and occupational safety, health and working conditions. The labour code on wages has been introduced in Lok Sabha on 10 8 2017 which is refer to the parliamentary standing committee on labour.

According to the Ministry of Labour and Employment, there are a number of measures being taken to improve the labour market conditions[312].

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309 World Bank Group, Reforming to Create Jobs, http://www.doingbusiness.org/~/media/WBG/DoingBusiness/Documents/Annual-Reports/English/DB2018-Full-Report.pdf (last visited Jun 2, 2018).

310 P. K. PADHI, LABOUR AND INDUSTRIAL LAWS 15 (2011)

311 MINISTRY OF LABOUR & EMPLOYMENT, LABOUR LAW REFORMS-EMPLOYMENT, https://labour.gov.in/labour-law-reforms (last visited Jun 6, 2018).

312 MINISTRY OF LABOUR & EMPLOYMENT, INITIATIVES OF CENTRAL GOVERNMENT, https://labour.gov.in/initiatives-central-government (last visited Jun 6, 2018).

4.2.10.1 Legislative Initiatives

Payment of Bonus Amendment Act has amended and increased the eligibility limit for payment of bonus from ` 10000/- to ` 21000/- per month and the Calculation Ceiling from ` 3500/- to ` 7000/- or the minimum wages. Payment of Wages (Amendment) Act, 2017 was introduced for enabling the payment of Wages to employees by Cash or Cheque or crediting it to their bank account.

Child Labour (Prohibition and Regulation) Amendment Act, 2016 has brought a complete ban on employment of children below 14 years in any occupation or process in line with the government policy for universal compulsory education for children below the age of 14. Maternity Benefit Amendment Act, 2017, increased the paid maternity leave from 12 weeks to 26 weeks and the Employee Compensation (Amendment) Act has rationalized penalties and strengthened the rights of the workers under the Act. The Payment Of Gratuity (Amendment) Act, 2018, ensured flexibility in ceiling limit of gratuity and the calculation of continuous service for the purpose of gratuity in case of female employees who are on maternity leave. Vide Notification dated 29th March 2018, the ceiling limit of gratuity has been increased from ` 10 Lakh to 20 Lakh and this period of maternity leave for calculation purpose has been enhanced from 12 weeks to 26 weeks.

4.2.10.2 Governance Reforms

Ease of Compliance to maintain Registers under various Labour Laws Rules, 2017 was notified on 21st February 2017 replacing 56 Registers/Forms under 9 Central Labour Laws and Rules into 5 common Registers/Forms. This measure is expected to ease compliance requirements under the Labour laws and social security regime in India.

The Model Shops and Establishments (RE&CS) Bill, 2016 has been prepared and circulated to all States governments and Union territories for adoption in their respective states which will bring uniformity in the processes and procedures. Establishments can function for 365 days in a year without any restriction on opening/closing time under the proposed bill.

The Industrial Employment (Standing Orders) Act, 1946, extended the Fixed Term Employment, with all Statutory Benefits, to all Sectors. This will give some amount of flexibility to the employers to employ workers through the Industrial Employment (Standing Orders) Central (Amendment) Rules, 2018.The number of Forms / Returns under 3 Central Acts / Rules were reduced from 36 to 12 by through notification dated 28.03.2017 in the year 2017.

4.3 VARIOUS LAWS COMPLIMENTING THE GROWTH OF THE SECTOR

A detailed evaluation of the above parameters and various other legislations complimenting the growth of the sector will be examined and evaluated in the context of investments in renewable energy sector.

4.3.1 BANKING AND FINANCIAL SECTOR REGULATIONS

Since the focus of the chapter is how various legislation, government policies, and regulations make it easy for the investor to do the business in the sector, the banking and financial sector regulations play an important role. It is the financial sector regulations which will affect the way an investor can mobilize his finances. It is thus important to keep the financial regulations in pace with the growing requirements of the economy.

4.3.1.1 The Regulatory Framework for Banking and Finance a brief overview

Banks are fundamental to differential system of a country. Reserve Bank of India being the central bank is bestowed with the responsibility of ensuring the safety and security of the banking system in India. Reserve Bank has been successful throughout its years of spearheading the financial sector regulation in maintaining the stability and public confidence in the system. The Reserve Bank of India is mandated to protect the interest of the depositor"s, development and orderly conduct of the banking operations and fostering the health of the banking system and its stability. Indian banking sector regulation

Hollywood with the development in the Indian and international banking system and also through adoption of and best practices[313].

The Reserve Bank of India apply various tools of regulations such as statutory, prudential norms and other regulatory guidelines. A bank need to obtain licenses for opening its business in India. It also requires authorizations from the Reserve Bank for opening branches across India. Reserve Bank of India also given the entry and expansion of foreign banks into India. The key functions of Reserve Bank include policy formulation review and implementation of prudential norms market and operational risk etc. Reserve Bank also monitor the requirements of SLR and CRR by the banks. Anti-money laundering and financial terrorism are tackled by stringent KYC norms. Reserve Bank also regulate other non-banking Financial Institutions involved in the financial market.

4.3.1.2 Renewable Energy and Banking Regulations

Reserve Bank of India has recognized the importance of renewable energy sector and its growing financial requirements. In order to Promote Investments in the sector Reserve Bank has promulgated directives. Reserve Bank through its notification dated 23rd April 2015 has included renewable energy sector as 7th item in the list of priority lending sectors.

4.3.1.2.1 Priority sector lending

Reserve Bank of India from time to time issues guidelines for priority sector lending. On April 23rd, 2015 Reserve Bank of India has issued new guidelines for priority sector lending. The Master Circular on priority sector lending- targets and classification has consolidated all the current instructions on priority sector lending[314].

The new guidelines Issued on April 2015 has brought renewable energy sector under priority sector lending vide regulation 4 of the master circular. According to the new guidelines enshrined under regulation 12 of the Master Circular.

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[313] Reserve Bank of India, Reserve Bank of India - Function Wise Monetary (2018), https://www.rbi.org.in/scripts/FS_Overview.aspx?fn=2752# (last visited Jun 3, 2018).

[314] RBI priority sector lending targets and classification, Priority sector Lending Guidelines, April 23, 2015 Reserve Bank of India 1–17 (2015).

Borrowers installing various renewable energy power plants can avail up to rupees 15 crore as bank loans. Remote village electrification and non-conventional energy based public utilities such as Street lighting systems are also eligible under this scheme. Individual household can avail loans up to rupees 10 lakh per borrower.

Priority sector lending targets are fixed based on adjusted net bank credit (ANBC) or credit equivalent amount of-of balance sheet exposure. ABC denotes the outstanding bank credit in India as prescribed in item number VI of form a under section 42 close to of The Reserve Bank of India Act 1934 reduced by bills discounted with Reserve Bank of India and other approved Financial Institutions added by permitted non SLR bonds or debentures which are eligible to be treated as part of priority sector lending.

According to the new guidelines, domestic commercial banks have a Priority sector lending target of 40% of a ANBC or credit equivalent amount of balance sheet exposure whichever is higher.

Commercial banks are obligated to provide an acknowledgment for loan applications and also communicate with the applicant the time within which a decision on the application will be intimated to the applicant. This measure ensure that timely availability of credit for the investors and allows them to plan their business activities accordingly.

4.3.1.2.2 Priority sector lending certificates

Assets originated by banks classified under the respective categories of priority sector are eligible for the fulfillment of priority sector lending. Banks which purchase priority sector lending certificates from other banks can use them to meet priority sector lending targets, as per regulation 18 of the Master Circular. Priority sector lending certificates PSLC is a mechanism whereby the banks can achieve the targets fixed under priority sector lending guidelines in the event of any short form through purchase of these certificates. The mechanism is beneficial to other banks as well who have achieved more than the required targets under the priority sector lending scheme. Under the PSLC scheme, the buyer purchases only the fulfillment of priority sector obligation, and there is no transfer of a risk or loan assets[315].

Government of India with a notification dated February 4, 2016, has brought dealing in priority sector lending certificates as a form of business under section 6(1)(o) of the Banking Regulation Act 1949. The notification dated April 7 2016 has detailed user manual for the banks to facilitate trading through the CBS portal[316].

The nature of instruments is such that the Sunday will be sending fulfillment of priority sector obligation and the buyer would be buying search certificates to come play with the requirements of priority sector lending.

Priority sector lending does not offer any preferential rate of interest. It does not takes into account the affordability of such loans as well as the ability of the borrower to pay a higher rate of interest. The banks usually follow the normal rate of interest as per the directions of the Department of Banking Regulation of Reserve Bank of India which issues directives on rate of interest on bank loans from time to time.

4.4 STATE GOVERNMENT REGULATIONS ON RENEWABLE ENERGY

Since electricity is a concurrent subject state governments have powers to regulate the electricity sector including the renewable energy sector. Various state governments have made different policies at the state level to facilitate in increased deployment of renewable energy sources in the respective states. Section 6 of the 2003 Act has made it the joint responsibility of the state and central government to ensure rural electrification[317]. Section 108 of the 2003

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[315] RESERVE BANK OF INDIA, MASTER DIRECTION-PRIORITY SECTOR LENDING-TARGETS AND CLASSIFICATION (2016), https://rbidocs.rbi.org.in/rdocs/notification/PDFs/NT366A 738 153D311A4A9082515990A98C5AF6.PDF (last visited Jun 3, 2018).

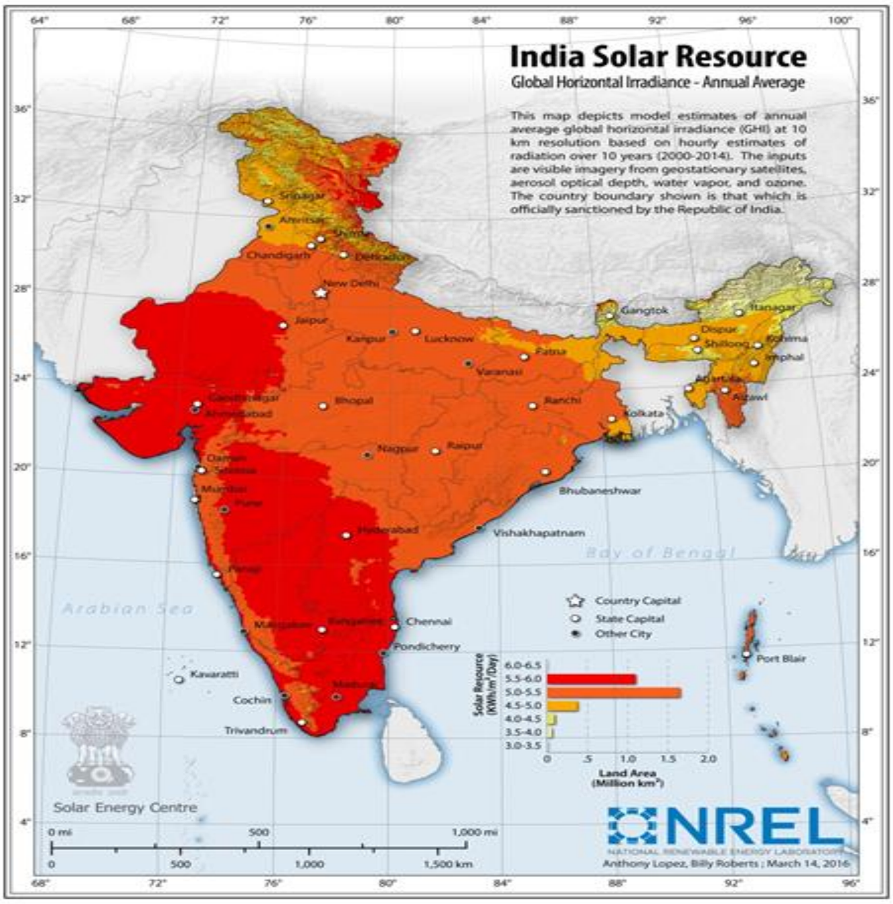
[316] Reserve Bank of India, on Priority Sector Lending -Targets and Classifications about introduction of Priority Sector Lending certificates (2016), www.rbi.org.in (last visited Jun 4, 2018).

[317] See Sec. 6 6. Joint Responsibility of State Government and Central Government in Rural Electrification-

Act provides that the state commission shall be guided by the directions of the state government in matters involving public interest. Section 180 of the Act empowers the state government to make rules.

4.4.1 SOLAR RESOURCE-RICH STATES IN INDIA

The following are the states endowed with rich solar resources based on solar irradiation data and various government reports. The below-given map shows the intensity of solar radiation in India[318].

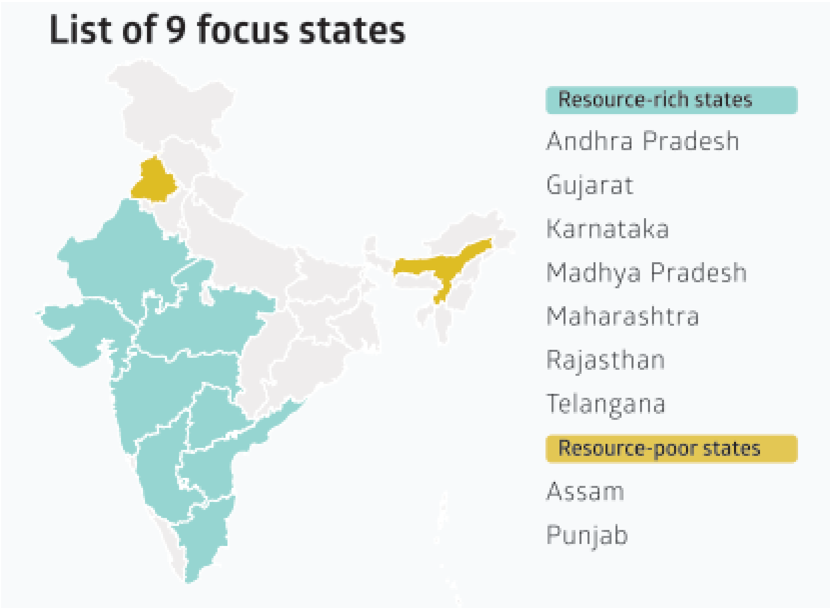


Source: NREL: International Activities - India Solar Resource Maps and Data

Fig. 4.1 Solar Resource-Rich Statesi India

The concerned State Government and the Central Government shall jointly endeavor to provide access to electricity to ail areas including villages and hamlets through rural electricity infrastructure and electrification of households.

318 NREL, INTERNATIONAL ACTIVITIES-INDIA SOLAR RESOURCE MAPS AND DATA, https://www.nrel.gov/international/ra_india.html (last visited Jun 5, 2018).



Source: NITIAyog, State Renewable Energy Capacity Addition Roadmap

Fig. 4.2 Focus States

NITI Ayog the planing and policy making body of the government of India, in its report titled "State Renewable Energy Capacity Addition Roadmap," has identified the following states as resource-rich states[319].

4.4.2 ANDHRA PRADESH

Andhra Pradesh initiated Power sector reforms in the year 1998 .The current installed capacity of electricity in the state is 16294 megawatt, of which 44.4 percent comes from coal-fired power plants 10.6 percent from hydro 7 percent from gas and 37.1 percent of electricity is produced from renewable energy sources[320].

The national renewable energy target for 2022 has apportioned 8 percent of the contribution from Andhra Pradesh amounting to 14000 megawatt of renewable energy. But the state has fixed itself a higher target of 10000-

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[319] State Renewable Energy Capacity Addition Roadmap, (2018), http://indiaenergy.gov.in/wp-content/uploads/2017/10/Executive-Summary.pdf (last visited Jun 5, 2018).

[320] Res, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS 1155 (2016), http://www.cea.nic.in/reports/monthly/installedcapacity/2016/installed_capacity-03.pdf (last visited Jun 7, 2018).

megawatt solar power and 8000 megawatt of wind power[321]. Ministry new and renewable energy Government of India has estimated a total of 82.5 gigawatt of renewable power from the state. This shall be the combined output of 44 gigawatt of wind and 38.5 gigawatt of solar power.

At micro level, the renewable energy purchase obligation target met in the state with 10 percent of the electricity consumed in the state coming from renewable energy sources. The state is expected to achieve 15 percent of its Total energy demand to be met through solar by the year 2022.

The solar policy 2015[322] is an initiative by the Andhra Pradesh government in order to increase the deployment of solar energy projects has created a favorable environment in the state. The state has made considerable improvements in the sector by introducing solar Park scheme, e-auction and successfully reduced the Solar tariffs below Rupees 4 per kwh.

After the successful bidding of large solar parks with thousand megawatt capacities, the state is now considering deployment of mini-grids, to augment the renewable energy capacity.

The key policy initiatives of the state which contributed for the growth of the sector in the state include exemption from electricity duty, wheeling and transmission charges for captive uses within the state, CSS, 100 percent banking facility, CDM benefits and PCB clearances[323].

4.4.2.1 Andhra Pradesh solar wind hybrid policy

Even though the policy is in a draft form it offers great hope for the growth of the industry. The policy has many objectives for the promotion of grid-

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321 Jawaharlal Nehru National Solar Mission Towards Building SOLAR INDIA, https://mnre.gov.in/sites/default/files/uploads/mission_document_JNNSM.pdf (last visited Jun 7, 2018).

322 MINISTRY OF NEW AND RENEWABLE ENERGY, SOLAR AND WIND POWER POLICIES, 2015 OF ANDHRA PRADESH RELEASED AT RE-INVEST 2015 (Feb. 15th, 2015) http://pib.nic.in/newsite/PrintRelease.aspx?relid=115480 (last visited Jun 7, 2018).

323 Centre for Sustainable Agriculture, Andhra Pradesh state policy on organic farming, INDIA ENVIROMENT PORTAL (July 26th 2008), http://www.indiaenvironmentportal. org.in/content/269874/andhra-pradesh-state-policy-on-organic-farming/ (last visited Jun 7, 2018).

connected wind solar PV systems for the optimal utilization of the land and infrastructure. The policy envisages to achieve better grid stability with cogeneration of wind and solar targeting 3000 megawatt of hybrid grid integrated power plants by 2019-20324. The policy on this is categorized into three parts where the first part proposes to combine generation of power at existing or new solar or wind power projects. The second category is big located addition of wind or solar at in the connection points of pooling stations of the existing solar or wind installations. The third category consist of adding Windows 16 after interconnection. Of pooling of the existing wind or solar installations and this is called co-injection. To make this policy attractive the government has offered exemption of distribution losses IV injection of power at 33 kilowatt voltage or below, exemption of T&D charges for wheeling, 100 percent banking of energy for the period of 12 months, exemption of CSS for third party sale within the state for a period of 5 years in cases of power sale to an Andhra Pradesh Distribution Company[325].

The steering committee of the state for this state roadmap for renewable energy for 2022 has held It's last meeting at Amravati on May 23rd 2017. The committee has identified the following measures required for the state to achieve the target for 2022[326].

1) The state will focus more on the energy storage with subsidy support from the central government to meet the high cost of batteries in the initial stages
2) The state require more incentives from the central government to meet RPO targets

[324] ANDHRA PRADESH WIND-SOLAR HYBRID POWER Policy–2016, http://nredcap.in/PDFs/Downloads/Draft_modified_wind_solar_hybrid_policy_10_08_2016.pdf (last visited Jun 7, 2018).

[325] Hoskote Nagabhushanam, *Andhra Pradesh's solar-wind park is largest*, DECCAN CHRONICLE (Dec. 2nd 2017), https://www.deccanchronicle.com/nation/current-affairs/021217/andhra-pradeshs-solar-wind-park-is-largest.html (last visited Jun 7, 2018).

[326] *supra* note 321 SOLAR INDIA.

3) The state will make provision for power system development fund and encourage pumped storage scheme 4 natural storage of green intermittent power

4) The stage will reconsider further addition of conventional power sources in the background of reduced demand growth and twin corporate more Green Power in the capacity addition

5) The excess renewable power produced in the state will be sold to Central Agencies to distribute to renewable energy deficit States

4.4.3 GUJARAT

Gujarat is one state which is rich in Renewable Energy potential. The radiation data suggest that Gujarat is receiving 300 days of sunshine and abundant land resource. Gujarat has limited hydropower potential and thermal power plants based on coal is not a viable option because the coal is sourced from the eastern parts of India about thousand 500 km away.

Currently about 52.8 percent of the installed capacity is based on coal-fired thermal power plants. Hydropower contributes a mere 2.9 percent, nuclear 2.1 % and the gas 17.2 percent. 25 percent of the installed capacity of electricity is from renewable energy[327].

The state is expecting to expand the renewable energy at an average annualized rate of 7.1 %. This would help the state to increase its renewable energy capacity to 17133 megawatt by 2022[328]. The state has a renewable purchase obligation of 19 % which is a driving force for capacity addition. To meet the RPO the state require 16 gigawatt of renewable energy by 2022. The annualized growth rate of renewable energy in the state is 22 % since 2011[329].

The challenges the sector face in the state include the need to strengthen areas like ease of doing business, incentives to the renewable sector and revised

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[327] *supra* note 320 RES.

[328] *supra* note 321 SOLAR INDIA.

[329] *supra* note 320 RES.

RPO as per National tariff policy. The non compliance of RPO by DISCOMshas increased the of take risk for developers. The lack of stability in the system due to increased Renewable Energy share in the electricity mix need to be addressed.

The past measures like feed-in tariff fast approvals and clearances exemption from electricity duty has helped the growth of the sector in this state. Today the state is providing policy and regulatory support along with financial incentives. The Gujarat electricity regulatory Commission has issued requirement of renewable energy regulation, which has established RPO targets in each category of renewable source for the obligated entities. As per this solar rooftop net metering regulation and Solar pump schemes power generated can be used for captive consumption and the excess power generated can be sold to distribution companies or third parties.

In the future the state will focus on meeting its own RPO target and also on a excess renewable energy to other states. The working group of the state has made some suggestions for the growth of the sector. Improve the ease of doing bye notifying RPO trajectory, strengthen the incentives identify and address operational challenges while implementing renewable energy projects. The group also recommended to improve flexibility in the system to observe 17 gigawatt of renewable energy India grid. Renewable energy forecasting tools and monitoring tools for grid management and reduce errors in scheduling the generation is considered an important measure to be implemented. The state also will focus on developing CTU connected renewable energy projects to facilitate interstate trade of renewable energy. State recommends document the transmission network at the state and Central level for efficient evacuation of renewable energy produced. The working group also suggest to move away from subsidy based Business models. It is also proposed faster implementation of renewable generation obligation and development of distributed solar projects the balance regional demand requirements through innovation Business models.

4.4.4 KARNATAKA

Karnataka has an installed capacity of 21208 megawatt, of which 45.1 percent thermal energy 17 percent hydro, 3.3 % nuclear and 34.7 percent comes from renewable energy sources. The Karnataka Electricity Reforms Act 1999 made major reforms in the power sector including separation of entities for generation and distribution. State was successful in bringing down peak demand energy deficits from 13.5 percent in 2013 to 0.2 percent in 2017[330].

Karnataka is also blessed with hydro and wind sources. 52 percent of the renewable energy produced in the state is contributed by windmills and 16-18 percent from solar and cogeneration plants.

The state has announced solar and renewable energy policy to augment the renewable energy capacity in the state. The state is also planning to add at 2000 megawatt solar capacity through a mega solar park in 2018-19. The national renewable energy target for 2022 has decided the share of Karnataka as 8.5 percent[331]. The Solar will contribute 38 percent and wind 42 percent.

Renewable energy constitutes 8 percent of the states energy supply. However, the Loafer threshold of RPO at 3 percent need to be increased to 8 percent to meet the renewable energy targets for 2022[332].

Various challenges faced by the state include the possible surplus energy that may be generated due to additional 2 GW of conventional sources of energy which is planned. Balancing the demand and the resources through proper planning is required. Do the state has planned for huge capacity addition, it cannot exploit its renewable energy potential to the fullest due to challenges in grid integration and lack of infrastructure for evacuation of energy produced.

The need of a long-term energy security is recognized by the Karnataka renewable energy policy 2009-14. The policy has set ambitious targets for

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[330] *supra* note 320 RES.

[331] *supra* note 321 SOLAR INDIA.

[332] *Id.*

renewable energy. Government of Karnataka promotes setting up of renewable energy projects under 3 categories

1) Feed-intariff-based or competitive bidding based projects
2) Captive and independent power producers mechanism
3) REC mechanism

Karnataka renewable energy policy 2014- 2021 provides for a comprehensive solar policy 2014-2021. Renew policy envisages to achieve 3 percent contribution from solar energy. The new policy has established the following targets by 2021.

1) Capacity addition of 2000 megawatt from solar
2) Translate Karnataka into an investor-friendly state
3) Encourage PPP model in renewable energy sector
4) Pramod new technologies and Solar rooftop power plants
5) Off-grid decentralized generation and distribution of electricity
6) Develop skill promote R and d and innovation.

Karnataka currently promotes net and gross metering and grid-connected solar rooftop projects. Karnataka electricity regulatory Commission has issued tariff orders for net and gross metering. Other incentives include exemption from pollution control board clearance, deemed conversion of land for solar projects, and reduction of supervision charges to 5 percent by electricity supply companies (escoms)[333].

The government has also meet the draught of Karnataka renewable energy policy 2016-22. The policy envisages capacity addition of 4000 megawatt by 2022 in a phased manner with no contribution from wind power. Develop infrastructure for interstate and intrastate Business models.

The new policy focuses on solar projects including large-scale solar parks. The state also plans interstate balancing facilities and industrial power supply to

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[333] GOVERNMENT OF KARNATAKA, SOLAR POLICY 2014-2021, https://mnre.gov.in/ file-manager/UserFiles/state-power-policies/Karnatava-Solar-Power-Policy_2014-2021. pdf (last visited Dec 4, 2018).

contribute significantly to support renewable energy deficit States utilizing the rich potential of renewable energy it has.

The status looking for subsidy support from the central government to focus on energy storage on large scale. State also recommend the central government to provide incentives to the states to meet the renewable purchase obligation target. It also demand the central government to provide air corridor for better inter-State Power transfer.

4.4.5 WEST BENGAL

The policy on cogeneration and generation of electricity from renewable sources of energy a policy document issued by the department of power and non-conventional energy sources, government of West Bengal, envisages ensuring in green generation of electricity for future generations. West Bengal electricity regulatory Commission (WBERC) has come up with the cogeneration and generation of electricity from renewable sources of energy regulations 2013 to facilitate growth in renewable energy sector. The set regulations mandates that a consumer of electricity can install a grid-connected rooftop solar PV plant if the installed capacity is at least 5 kilowatt[334].

Solar photovoltaic as one of the focus areas under the new policy. Government has set targets for itself for achieving Rooftop And grid Connected power generation targets. The policy envisages decentralized distributed generation for all remote and non-electrified villages. Projects shall be under Rajiv Gandhi GrameenVidyutikaranYojana in the 11th plan and other related directors issued by the Ministry of Power Government of India in this regard. The policy provides for competitive building for allotment of projects. Bidders who qualify by fulfilling the Minimum requirements will be I"ll Tibet for various projects. The policy also allows bidding for part capacity of a

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334 Department of Power & Nonconventional Energy Sources & Govt. of West Bengal, Policy on Co-generation and Generation of Electricity from Renewable Sources of Energy Department of Power & Nonconventional Energy Sources, Govt. of West Bengal (2012), http://www.wbreda.org/wp-content/uploads/2012/06/policy-renewable-wb.pdf (last visited Jun 4, 2018).

specified project. For facilitating deployment of renewable energy projects the government land vested with the government for a period of 30 years or for the entire project life whichever is less. The nodal agency for all clearances through a single window system is the West Bengal Green Energy Development Corporation Limited (WBGEDCL)[335].

A successful bidder shall commence the project installation within six months after getting all clearances. The nodal agency is empowered to closely monitor the progress of the work. The developer is also under an obligation to commission the project within such period as stipulated in the agreement.

4.4.5.1 Green Energy Fund

The nodal agency is responsible to setup a green energy fund for providing financial assistance to renewable energy projects in the state. The seed capital for the fund comes from the contributions of the state government and international agencies. The nodal agency is mandated to ensure the self-sustainability of the fund by generating adequate revenue using the initial seed capital[336].

In addition to the above, the following benefits are also extended to the developer by the policy. All the concessions and incentives, generation based incentives etc allowed by the MNRE, GoIwill ipso facto extended to the developer by the government of west bengal. The distribution utilities will extend the letter of credit facility to the developer for financial requirements. The cost for such letter of credits are met by the green energy fund.

4.4.5.2 Other incentives

Other incentives provided by the government of West Bengal include exemption of demand cut up to 50 percent of the installed capacity assigned

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[335] WBREDA, WELCOME, http://www.wbreda.org/ (last visited Nov 30, 2018).

[336] WEST BENGAL ELECTRICITY REGULATORY COMMISSION, West Bengal Electricity Regulatory Commission (Cogeneration and Generation of Electricity from Renewable Sources of Energy) Regulations, 2013 (2013), https://mnre.gov.in/file-manager/UserFiles/Grid-Connected-Solar-Rooftop-policy/West_Bengal_ERC_ Notification_ 2013.pdf (last visited Jun 4, 2018).

for captive use. Distribution utilities are obligated to provide revolving letter of credit from a nationalized bank asset payment security mechanism for the developers[337]. Where projects are located at remote places the government is under obligation to provide infrastructural support including approach roads. Net metering support is available to solar rooftop systems connected with the grid.

West Bengal Renewable Energy Development Agency (WBREDA) was formed in the year 1993 and is empowered with the mandate to develop renewable energy in the state[338]. The West Bengal policy on renewable energy was introduced in 2012 and is still in force[339]. The West Bengal green energy Development Corporation Limited (WBGEDCL) is the nodal agency for development of renewable energy in the state.

4.4.5.3 Role of WBGEDCL

The nodal agency is responsible to maintain a database of all the RE projects in the state. They are mandated to promote private sector investment and involvement. Vishal also assest the developers in getting various incentives for implementation of projects[340]. WBGEDCL conducts studies for renewable energy resource assessment, Identification and creation of land Bank, manage green energy fund and solicitation of the project based competitive bidding[341].

The WBSERC has set the following RPOs from time to time to promote the market for RE

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[337] *Id.*

[338] *supra* note 335 WBREDA,

[339] Department of Power & Nonconventional Energy Sources & Govt. of West Bengal, POLICY ON CO-GENERATION AND GENERATION OF ELECTRICITY FROM RENEWABLE SOURCES OF ENERGY (2012), http://www.wbreda.org/wp-content/uploads/2012/06/policy-renewable-wb.pdf (last visited Jun 4, 2018).

[340] *Id.*

[341] WBREDA, RENEWABLE ENERGY POLICY OF WEST BENGAL, http://www.wbreda.org/renewable-energy-policy-of-west-bengal/ (last visited Jun 4, 2018).

Table 4.2 Solar RPO

year	Minimum quantum of purchase (in %) of total consumption from Cogeneration and Renewable energy sources	
	Solar	Total including Solar
2013-14	0.10	4.0
2014-15	0.15	4.5
2015-16	0.20	5.0
2016-17	0.25	5.5
2017-18	0.30	6.0

Source: West Bengal Electricity Regulatory Commission (Cogeneration and Generation of Electricity from Renewable Sources of Energy) Regulations, 2013.

Obligations for the licensees as specified in regulation 3.1 of West Bengal Electricity Regulatory Commission (Cogeneration and Generation of Electricity from Renewable Sources of Energy) Regulations, 2013 are "minimum percent of purchase which is endeavoured to be maintained by the licensees. According to the regulations the licensees may purchase, in excess of the given target to achieve the Ultimate Target. But such procurement in no case can go beyond the maximum limit of 5% of the total consumption in the area of the supply of the distribution licensee. It also provides further that "for purchase of solar energy beyond the target of any year shall not exceed 0.25% of the total consumption in the area of supply of the distribution licensee for that year or target of solar RPO for that year whichever is higher[342]."

Regulation 5.3 suggests that "Notwithstanding anything contained contrary to any other regulations, the solar power shall be purchased through competitive bidding only. However the solar power purchased from any source under JNNSM bundled power which are selected through competitive bidding, will not be required to go through any separate competitive bidding by the licensee."

The Competitive bidding though promotes to estableish a market equilibrium, therugulation further provides for capping of the prices under regulation 6.1.(v). The regulation reads as follows:

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[342] *supra* note 336 WEST BENGAL ELECTRICITY REGULATORY COMMISSION.

The capped price of energy for grid connected Solar PV power plants (including those plants which are availing accelerated depreciation benefit under section 32 of the Income Tax Act, 1961) which are not eligible for any incentive declared by MNRE, shall be ` 8.90 / kwh for sale to the licensees and such price will be applicable for the grid connected Solar PV power projects commissioned upto 2012-13 and shall remain valid for 25 years. The capped price of energy and period of validity for grid connected Solar PV power plants (including those plants which are availing accelerated depreciation benefit under section 32 of the Income Tax Act, 1961) which are commissioned after 2012-13 shall also be ` 8.90/ kwh for the projects commissioned upto 2015 - 2016 or till the date as notified by the Commission, whichever is earlier and shall remain valid for 25 years[343].

Though the caping has been made at a higher price of 8.90, the existence of such a mechanism in the policy framework itself poses a threat to the future growth of the sector. Consequence of Non-compliance of Renewable & Cogeneration Purchase Obligation is an action being initiated under section 142 of the Electricity Act 2003.

It can be seen that the penalties and punishments are not sufficient to enforce the RPO in a stringent manner.

4.4.5.4 Challenges

The capacity requirement of 5 kilowatt required are higher investment and higher space requirement a 5 kilowatt Solar Power Plant with 12 percent panel efficiency may require 625 square feet of Shadow free a rooftop space. So the benefit of this regulation cannot be availed buy small-scale investors. Only investors with a higher generation capacity above 5 kilowatt are eligible to get grid connectivity. The initial cost of Renewable energy projects like solar is very high, and the requirement of security deposit with the government makes

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343 *Id.*

the investor to mobilize more funds for his initial investments reducing the return on capital.

4.4.6 UTTAR PRADESH

The new mini grid policy of the Government of Uttar Pradesh adopted in 2016[344] has sped up electrification process in rural areas the new policy facilitates electrification of rural areas through renewable energy and mini-grid deployment. These Mini gifts will not have access to the national grid. The benefit of the policy is extended only to unelectrified areas and not even to low levels of electrified areas. The policy has Limited the maximum capacity of each project to 500 kilowatt.

The meaning in IT project of the Government of Uttar Pradesh has laid down comprehensive policy framework for the developers and operators to deploy Mini grid projects under 2 models envisage by the policy.

In the first model, the state government or the Distribution Company will identify the project location fix the customer tariff and specify the technical requirements of the project. The developers in such cases will be entitled to a 30 percent of capital grant support. The developers are supposed to fulfilled conditions such as 8 hours of supply of electricity for residential units and 6 hours of supply of electricity to commercial units. The developer shall also confirm to the technical standards and specifications issued by the central electricity authority and UPPCL. It is also mandatory that the developer strictly follows electrical safety and security standards.

The second model does not provide any capital grant support to the developer. The developer can choose a project location of his choice with the tariff at which the power is distributed to the customer. The development of this

[344] Government of Uttar Pradesh, UTTAR PRADESH MINI GRID POLICY 2016, http://www.upneda.org.in/mediagallery/Mini-Grid-Policy-2016.pdf (last visited Nov 30, 2018).

scheme may avail the benefits of the industrial policy and exit process which is available in case of conventional grid access[345].

1) Mini grid projects must be executed within certain time frames
2) 6 months in case of projects based on solar PV panels
3) Biomass and biogas plants within 9 months
4) Wind and other small scale power projects shall be completed within one year

Uttar Pradesh net metering regulations came into force from 20th of March 2015.

Uttar Pradesh Solar Energy Policy 2017[346] came into force in the year 2017 with the objectives of encouraging private sector participation, providing affordable and environment friendly power for all, promote research and development and achieve 8% Solar RPO. The policy will be implemented as follows:

A. Utility Scale Grid-Connected Solar Projects

   The utility Scale power projects will be of the following categories

   a. Category-1 Solar Parks with a minimum size of 100 MW Capacity

      i. Public Sector Solar Parks

      ii. Private Sector Solar Parks

   b. Category-2 Large Scale Standalone Solar Projects

      The state government will bear the cost for construction of transmission lines subject to the power produced.

   c. Category-3 Large Scale Power Projects on Canals or Lakes

   d. Category-4 Large Scale standalone solar projects for third party captive purpose

B. Grid Connected Solar Rooftop Projects

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345 UTTAR PRADESH NEW AND RENEWABLE ENERGY DEVELOPMENT AGENCY, MAJOR PROGRAMMES UNDER GRID CONNECTION, http://www.upneda.org.in/ programmes-under-grid-connection.aspx (last visited Nov 30, 2018).

346 Government of UTTAR PRAdesh, Uttar Pradesh Solar Energy Policy 2017, http://www.upneda.org.in/MediaGallery/Uttar_Pradesh_Solar_Energy_Policy-2017_English__0.pdf (last visited Nov 30, 2018).

The project developers will be incentivized through net metering or gross metering. This policy will be largely focused on government/semi government/public institutions with UPNEDA as the nodal agency[347]. For Residential and private institutions the government will provide a subsidy of ` 15000/KW up to a maximum of ` 30000/-.

C. Ease of Doing Business
    a. To improve the ease of doing business the government has introduced the following.
    b. Single Window clearance for all solar power projects
    c. Energy banking in every financial year subject to the inspection by the state distribution company.
    d. Electricity duty exempted for sale to distribution licensee, captive consumption or third party sale within the state. This exemption is not available if the sale is made outside the state.

4.4.7 TAMIL NADU

The Tamil Nadu Energy Development Agency (TEDA) was established as a registered society, as early as in 1985[348]. The objectives of the agency were to promote the use of renewable energy, energy conservation and research and development in renewable energy[349]. The Tamil Nadu Solar Energy Policy 2012 was the major policy document till date which has driven the growth of the solar in the state[350].

Government of Tamilnadu provides subsidy of rupees 20000 per kilowatt for individual or group applications with a plant capacity of 1 kilowatt. The subsidy scheme can be availed by grid connected rooftop solar systems

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[347] *Id.*

[348] G.O.Ms.No.163, P.&D. (EC) Department. Dated 29.11.1984.

[349] T.E.D.A., INTRODUCTION https://teda.in/ (last visited Dec 1, 2018).

[350] MINISTRY OF NEW AND RENEWABLE ENERGY, TAMIL NADU SOLAR ENERGY POLICY 2012, https://mnre.gov.in/file-manager/UserFiles/state-power-policies/Tamilnadu- Solar-Power-Policy.pdf (last visited Dec 1, 2018).

comprising of solar PV modules rooftop support structure solar grid inverter cabling and protective devices.

The unconsumed solar power exported into the TANGEDCO Grid will be eligible for net metering. Under net metering scheme the net energy imported or exported into the grid is metered.

Institute for Energy Economics and Financial Analysis (IEEFA), studied top 15 countries and power markets in the world by their share of renewable energy in the net electricity mix. Denmark was at the top with 53% and Tamil Nadu, the only Asian market with 14% share of renewables in the electricity mix found a place in the list[351]. According to the report the availability of rich wind and solar resources, demand and supply gap, and robust government policies have made this feat possible for the state. The government has improved the transmission networks, infrastructure and also encouraged firms to expand. Tamil Nadu has applied forecasting energy supply to deal with the fluctuations in power generation from the renewables[352].

In 2018 the TEDA has formulated the draft Solar Energy Policy 2018[353] and has invited public comments on the draft policy. The policy envisages to create an ecosystem to transform the energy vision into policy and processes framework.

The new draft policy envisages to install 8884 MW of solar power by 2022. All public building, street lighting and water supply shall meet 30% of their

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[351] Power-Industry Transition, Here and Now Wind and Solar Won't Break the Grid: Nine Case Studies, (2018), http://ieefa.org/wp-content/uploads/2018/02/Power-Industry-Transition-Here-and-Now_February-2018.pdf (last visited Dec 1, 2018).

[352] Sushma, *How Tamil Nadu became one of the world's leading renewable energy markets,* QUARTZ INDIA (Feb. 19th 2018) https://qz.com/india/1208222/how-tamil-nadu-became-one-of-the-worlds-leading-renewable-energy-markets/ (last visited Dec 1, 2018).

[353] Inviting Comments & Inputs on Draft Tamilnadu Solar Energy Policy-2018, http://teda.in/wp-content/uploads/2018/09/Draft-Policy-note-2018.pdf (last visited Dec 1, 2018).

energy requirement from solar energy. It also mandates that 10% of the government vehicles to be replaced by electric vehicles[354].

The incentives offered for encouraging investments in the solar include exemption from electricity tax, grid connectivity, open access, wheeling, and banking and cross-subsidy charges. The policy has also proposed to create suitable incentive schemes for energy generation in the agricultural sector. The policy not only encourages developers, being one of the major manufacturing states in the country, Tamil Nadu is promoting manufacturing of the solar installation components including solar modules in the state. The policy also envisages to develop a scheme where there is co-utilization of land for solar energy projects, crop cultivation and rainwater harvesting. It is also proposed to relax property taxes for those domestic building owners who install solar energy systems. There will also be schemes to promote research and development in the field of solar energy[355].

4.4.8 RAJASTHAN

Rajasthan is the largest state in India and has witnessed improvements in strengthening generation capacity and network infrastructure. The state has at portal installed capacity of 18 GW of which 50 % comes from power plants and renewable energy contributes 30 %. The state has only 0.2 % power deficit and 75.4 percent of its households are electrified[356].

Rajasthan is one of the high potential States with an estimated capacity of 142 for solar and 18.7 GW for wind. Rajasthan Solar Energy Policy 2014[357] has estimated a target of 25 GW by 2022[358]. Rajasthan has an installed capacity of 6198 MW renewable energy.

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354 *Id.*

355 *Id.*

356 *supra* note 320 RES.

357 Rajasthan Renewable Energy Corporation, RAJASTHAN SOLAR ENERGY POLICY, 2014 (2014), http://rips.rajasthan.gov.in/menupdf/Rajasthan-Solar-Energy-Policy-2014-10.pdf (last visited Dec 1, 2018).

358 *supra* note 321 SOLAR INDIA.

Major challenges faced by the state are balancing services, back down by DISCOMs, delay in availing MNRE subsidy, Limited capacity of state agencies in terms of Manpower, awareness etc.

Rajasthan solar Park Development Company limited has been appointed as the SPV develop and manage solar parks in Rajasthan. The project is expected to make a capacity addition of 4505 megawatt of electricity. The large agriculture base of the state constitutes 42 percent of the power consumed in the state. To give more flexibility to farmers for irrigation purposes the government has planned installation of 1 lakh solar pumps. The state is also developing and evacuation infrastructure for transmission of 9.6 GW interstate electricity and 4.5 GW intrastate electricity. Rajasthan will be and net exporting state of renewable energy due to its rich resources.

The state is proposing to develop a Framework for Regional balancing of renewable energy, real time monitoring of generation, forecasting tools, developing CTU connected renewable energy projects, restructuring renewable energy contacts, renegotiate power purchasing agreements develop distributed solar projects and hybrid power plants. The state also recommends dedicated programs to develop innovative business models[359].

From 26 to February in 2015 the net metering policy is implemented and Rajasthan. Rooftop solar PV installations are eligible for net metering at a tariff rate of 7.5 rupees per install the unit. The lower threshold of a grid connected Solar Plant is 1 kilowatt and the upper limit is 1 megawatt. An individual consumer cannot exceed solar rooftop plant having a capacity of more than 80 percent of the sanctioned connected load.

4.4.9 TELANGANA

Telangana has a current installed capacity of 12672 megawatt of power of which 7476 megawatt is generated from thermal power plants using coal.

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[359] Government of Rajasthan, RAJASTHAN SOLAR ENERGY POLICY 2011 (AMENDMENT 2011), https://mnre.gov.in/file-manager/UserFiles/state-power-policies/ First-Amendment-Rajasthan-Solar-Power-Policy.pdf (last visited Dec 4, 2018).

Coal power plants constitute 59 percent of the total installed capacity. The remaining electricity is generated through hydro power plants with 17.7 percent contribution, gas 12.4 percent, nuclear 1.2 %, and renewable energy constituting the remaining 9.7 percent[360].

Telangana has a target of 3.7 percent of the total renewable energy production at the national level with 69 percent contribution from solar[361]. The state has renewable energy potential of 20.4 GW of which only 4.27 % has been realized so far.

The Telangana solar policy 2015[362] provides the basic policy framework for promoting solar energy in the state. Telangana uses solar pumps to use the excess renewable power generated during the daytime which help set balance the energy demand and supply. The new policy envisages to aggressively pursue and expand the rooftop solar capacity.

Some key incentives offered by the state include electricity duty exemption, exemption from VAT, wheeling and transmission charges, stamp duty, Clean Development Mechanisms (CDM) benefits and PCB clearances, land ceiling, 100 percent credit, Compact Sub Stations (CSS)[363], single window clearance[364] etc.

Telangana has the following recommendations to improve the renewable energy sector in the state. The state proposes to promote the use of electric vehicles to augment the demand and incentivize the consumption through tariff based plans. It also proposes to promote interstate power supply agreements. To address the technical issues related to solar pumps the state is

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[360] *supra* note 330 RES.

[361] *supra* note 321 SOLAR INDIA.

[362] Government of Telengana, TELANGANA SOLAR POWER POLICY 2015, https://mnre.gov.in/ file-manager/UserFiles/Grid-Connected-Solar-Rooftop-policy/Telangana_Solar_Power_Policy_2015.pdf (last visited Dec 1, 2018).

[363] *supra* note 319 State Renewable Energy Capacity Addition Roadmap.

[364] Government of Telangana, SINGLE WINDOW MECHANISM FOR SOLAR POWER PROJECTS, https://www.tssouthernpower.com/ShowProperty/CP_CM_REPO/Pages/Hotlinks/ Telangana SolarPowerPolicy/Single Window Mechanism for Solar PP (last visited Dec 1, 2018).

envisaging to create a pool of skilled local technicians in every village. The state is also demanding the central government to compensate it for the high tariffs of solar projects located during the initial stages of Jawaharlal Nehru Solar Mission. The state also recommends for installation of renewable energy storage Technology throughout the state for deployment of battery storage based solar power plants.

4.4.10 MAHARASHTRA

The largest electricity consumer base is located in the state of Maharashtra. The state has made substantial improvement incapacity edition and distribution infrastructure. Maharashtra has 41 GW of installed capacity with 60 percent of the electricity produced from thermal power plants using coal[365]. Renewable energy contributions constitute 18 percent of the total installed capacity. There is lack of demand growth creating the problem of large payouts as fixed charges under power purchasing agreements.

The state has a renewable energy potential of 114 GW. The state also has 6.9 gigawatt potential for distributed solar projects. Renewable energy in the state has grown at 15 percent to reach 7.4 GW in November 2016. The renewable energy target for Maharashtra under the state policy is 14.4 GW by 2020.

The state managers the variability of renewable energy generation with the help of hydroelectricity. It has a flexible capacity of 2250 MW. Maharashtra is one of the top States with the percent of their RPO compliance.

Maharashtra Renewable Energy Policy 2015[366] announced a focus on development of 14.4 GW renewable energy by 2020. The policy envisages 7.5 GW solar energy capacity addition. The state provides incentives switches capital subsidy electricity duty exemption etc.

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[365] *supra* note 320 RES.

[366] Government of Maharashtra, MAHARASHTRA RENEWABLE ENERGY POLICY 2015, https://www.mahaurja.com/meda/data/grid_solar_power/Policy for Grid Connected Solar Power Projects - English.pdf (last visited Dec 1, 2018).

Maharashtra has a scheme for supporting agricultural consumers through a solar irrigation pump scheme. The scheme proposes to install 5 lakh solar irrigation pumps with only 5% contribution by the farmers and the remaining by state government contributing 5 percent of the pump cost, central government with 30 percent contribution and loan from banks for the remaining 60 percent.

Maharashtra is also propose to develop rooftop solar by developing and net metering framework. This state nodal agency for this is accepting subsidy applications online. Maharashtra has one of the strongest intrastate transmission networks which can absorb 14 GW of RE under green energy corridor[367].

The state recommends to develop hybrid power plants using wind and Solar Technology, innovative business models for agricultural consumers to move away from subsidy driven model, real time monitoring of demand and generation of renewable energy along with forecasting tools.

The state also propose for exploring this thermal plants using as backup arrangements to balance capacity. It also proposes a faster implementation of renewable generation obligation (RGO)

The Maharashtra Electricity Regulatory Commission (Net Metering for Roof-top Solar Photo Voltaic Systems) (First Amendment) Regulations, 2017 has amended the New and Renewable (Nonconventional) Energy Sources 2015 to expand the scope from solar energy to renewable energy[368].

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367 MAHARASHTRA ENERGY DEVELOPMENT AGENCY, POLICY/GOVERNMENT RESOLUTIONS, https://www.mahaurja.com/meda/off_grid_power/solar_energy/policy_government_resolutions (last visited Dec 1, 2018).

368 SAUR ENERGY INTERNATIONAL, MAHARASHTRA SOLAR ENERGY POLICY, (Apr. 27th 2017) http://www.saurenergy.com/solar-energy-policy-india/maharashtra-solar-energy-policy (last visited Dec 1, 2018).

4.4.11 MADHYA PRADESH

The State Government of Madhya Pradesh has adopted an innovative decentralized solar policy 2016[369]. The policy has proposed three categories of grid connected power systems, such as net metering, no export, and third party consumption with wheeling and banking. It also permits multiple configurations. A rooftop system can be owned by the beneficiary or a Renewable Energy Service Company (RESCO). The new policy supports the installation of rooftop solar, small scale wind, small biogas project or a combinations of these[370].

The state has current installed capacity of 19849 MW of electricity. The coal fired thermal power plants constitutes 62.3 percent of the total installed capacity 18.2 percent of hydro and 3.2 percent of nuclear and gas are other major sources[371]. Renewables constitute 18.2 %.

Madhya Pradesh is rich with renewable resources and the ministry of New and renewable energy sources has estimated a potential of 74.33 GW of power. The state is one of the leaders in Renewable Energy installed capacity with 18.2 percent of energy coming from Renewable Sources.

Madhya Pradesh has are renewable energy target of 6.8 % of the national renewable energy production by 2022[372]. 47 percent of the targeted 11979 megawatt power will be generated from solar. The state has realised only 4.4 percent of its total renewable energy capacity. The state meet 8.5 percent of its energy demand from renewable energy sources.

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369 Madhya Pradesh Policy for Decentralized Renewable Energy Systems, 2016, http://www.mprenewable.nic.in/Decentralized RE Policy in English 24.09.2016.pdf (last visited Dec 1, 2018).

370 Saumy Prateek, *Madhya Pradesh Introduces Innovative Decentralized Solar Policy*, MERCOM INDIA (Oct. 1st 2018) https://mercomindia.com/madhya-pradesh-introduces-decentralized-solar-policy/ (last visited Dec 3, 2018).

371 *supra* note 320 RES.

372 *supra* note 321 SOLAR INDIA.

Some of the challenges faced by the state include the capacity additions plant in non-conventional power which may create huge surplus in the state. The green energy corridor, availability of credit, energy balancing for future and a higher target for a rooftop solar are some other challenges faced by the state.

The state need to promote power consumption through tariff based incentives and device interstate power supply arrangements to match demand and supply. The state has recommended to the central government for incentivizing the energy surplus states for supply of power. It also recommends to give more focus to night banking. A dedicated department for pumped hydro storage is also considered.

4.4.12 ASSAM

The Assam Solar Energy Policy, 2017 was notified in the official gazette on 16th January 2018[373]. Assam has one of the lowest rate of electrification in the country at 53 %. Floods, insurgency and in accessible terrains how caused the poor electrification of rural Assam. The state has a total installed capacity of 1440 6 MW of which 67 % is conventional energy followed by 30 percent from hydropower and only 3 percent of energy is being generated from renewable energy sources. The state is improving its energy supply by meeting various targets[374].

The state has a renewable energy potential of 45 GW with a maximum capacity in solar. Due to the lack of renewable energy capacity Assam continuously lives in meeting its renewable energy purchase obligation targets. The Assam electricity regulatory Commission has notified 8.5 % of RPO till 2020, which was later reduced to 5 % till 2019.

In addition to the Limited renewable energy potential of the state it faces are the challenges such as Limited availability of land for setting up solar power

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[373] Government of Assam, ASSAM SOLAR ENERGY POLICY, 2017, http://www.aegcl.co.in/06022018Gazette-Solar_Policy.pdf (last visited Dec 3, 2018).

[374] *supra* note 320 RES.

plants, lower irradiation leading to low yield of solar power plants, lack of state Agencies capacity to implement and manage bigger projects etc.

The strategies adopted by the state to improve the renewable energy situation include requiring renewable energy from other states, promoting grid connected rooftop solar projects, promoting solar pump, strengthen regulatory framework for net metering and regulation of tariff and purchase obligations. The state has planned a capacity addition of 270 megawatt in Renewable Energy.

The state has made some key recommendations for improving the situation which include developing at clear policy framework to encourage entities to meet RPO target, develop distributed solar projects, capacity building of discounts and other and that is in the state, encourage renewable energy in the tea sector and real time monitoring of demand and generation of renewable energy for managing the grid.

4.4.13 PUNJAB

Punjab has and installed capacity of 14000 megawatt of electricity of which 59.9 percent is produced by coal based thermal power plants[375]. Hydro projects contribute 26 percent, nuclear 1.4 %, gas 2.7 percent and renewable energy 9.8 %.

Panchayat has and a portion to target of 2.9 percent of the national renewable energy target. Of this 93 % will be contributed by solar. The state has exploited only 22 percent of its renewable energy potential. Solar energy constitutes 56 percent of the installed renewable energy capacity in the state. It is also difficult for the state to achieve 8 percent National solar target[376] given the non-availability of land.

Other challenges faced by the state include issues in grid integration, lack of balancing reserves in the state and lack of adequate subsidies. The mass

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[375] *Id.*

[376] *supra* note 321 SOLAR INDIA.

awareness programme of the government has also launched with the aim of educating the masses about the renewable energy[377].

Punjab renewable energy sector in Punjab is governed by the Punjab New and Renewable Sources of Energy Policy 2012[378]. The policy envisages to develop and promote new and renewable sources of energy, energy conservation and promote Clean Energy and reduce pollution. The fiscal and Technical incentives under the new policy include grid interfacing, power wheeling, open access, and various other fiscal assistant by the state government.

4.5 OTHER LEGISLATIONS WHICH PROMOTING DEVELOPMENT OF RENEWABLE ENERGY

The pollution control legislations compel industres to go green. thus they provide an essential momentum required for the sector to grow on the green wings of other businesses.

4.5.1 CENTRAL POLLUTION CONTROL LAWS

The ministry of environment, forest and climate change has developed criteria of categorization of industrial sectors based on the pollution index. The pollution index is derived as a function of air pollutants water pollutants hazardous waste and consumption of resources. The legislations which governed the pollution standards include the Water (Prevention and Control of Pollution) Cess (Amendment) Act 2003[379] and the Environment Protection Act 1986[380]. The pollution index is on a scale of zero to hundred and the increase in value of pollution index denotes and increase in degree of pollution from the particular industrial sector.

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[377] MASS AWARENESS AND PUBLICITY PROGRAMME, The development and application of New and Renewable, http://peda.gov.in/main/images/MAP_progress_report. pdf (last visited Dec 5, 2018).

[378] GOVERNMENT OF PUNJAB, NEW AND RENEWABLE SOURCES OF ENERGY (NRSE) POLICY 2012, http://peda.gov.in/main/tenders/nrse pol 2012.pdf (last visited Dec 5, 2018).

[379] Government of India, THE WATER (PREVENTION AND CONTROL OF POLLUTION) CESS (AMENDMENT) ACT, 2003, No.19 of 2003 http://bombayhighcourt.nic.in/ libweb/actc/ yearwise/2003/2003.19.pdf (last visited Dec 6, 2018).

[380] THE ENVIRONMENT (PROTECTION) ACT, 1986, No. 29 of 1986, http://envfor.nic.in /legis/env/env1.html (last visited Dec 6, 2018).

The range of pollution index for the purpose of industrial sectors categorization are as follows

1) Industrial sectors having pollution index score of 60 and above is classified as Red category
2) Industrial sectors having pollution index score of 41 to 59 Orange category
3) Industrial sectors having pollution index score of 21 to 40 green category
4) Industrial sectors having pollution index score after 20 weight category.

Any industry falling under the classification of white category need not require a prior consent to operate from the state or central pollution control board. Any intimation to the respective state pollution control board or pollution control board shall be sufficient. There are 36 industrial sectors which are falling under the white category.

The pollution control board has classified renewable energy sector comprising of solar wind and small hydro as White category. The purpose of the categorization is to ensure that the industry established are inconsistent with environmental objectives. The policy is expected to promote industries to adopt cleaner Technologies and generate sure pollutants.

4.6 CONCLUSION

The Business Reform Action Plan released by the Department of Industrial Policy and Promotion (DIPP) along with World Bank Group in April 2017 had 405 recommendations for improving the ease of doing business in India. The assessment carried out on the attainment has revealed a national average of 48.93% implementation. This suggests that we are lacking at the implementation and not at having appropriate policies for developing the business environment.

The advancements in the company registration process through simplified forms and online registrations are welcome moves from the government. The single window clearance system adopted by the Delhi administration has successfully eliminated the manual application process about construction permits. Delhi also has a streamlined process for providing electricity connectivity within 7 days. But other parts of the country need to match up to this. Getting land is a major concern. India has not made any progress in the area of registering property is concerned. Land being a state subject the state governments also have a major role to play in this. Streamlining the property registration is a major step the governments should focus upon for attracting investments to the country.

Getting credit for business, especially for solar is very critical to the development of the sector. Concerns of being a new lending sector, and lack of knowledge of managers are adversely affecting the credit availability. The environment for paying taxes and enforcing contracts have been generally improved in India. Honoring power purchase agreements by DISCOMS is depended on the efficacy in its enforcement. The existing enforcement mechanisms through electricity regulatory commission and electricity appellate tribunal are better ways compared to normal civil court. In *Lanco Budhil Hydro Power Private Ltd. v. Haryana Electricity Regulatory Commission*[381] it was held that the central electricity commission has the exclusive jurisdiction over Interstate Power Purchase Agreements. Another recent development from United States of America is the ruling given by the Bankruptcy court. It has held that the Bankruptcy court has exclusive jurisdiction decide the honoring of power purchase agreements of companies undergoing bankruptcy proceedings. A question yet to arise in India.

The policies of the state governments can be observed to have uniformity and coherence. Most of the state government policies have adopted exemption from electricity duty (UP, Rajasthan, Andhra Pradesh) Exemption from wheeling charges within the state. RPO serves another major driver for promotion of renewable energy a state level. States like Karnataka provides an

[381] Appellate Tribunal for Electricity, Order dated 9-8-2012 in Appeal No. 188 of 2011

efficient feed in tariff mechanism. The states promote competitive bidding-based projects and development by independent power producers.

The categorization system also facilitates as self-assessment by industries. This also satisfies the objective of ease of doing business asset simplify the procedure for obtaining environmental clearances if an industry falls in less polluting category.

CHAPTER 5

BARRIERS TO RENEWABLE ENERGY DEVELOPMENT

5.1 INTRODUCTION

The correlation between energy consumption and Human Development Index suggests the importance of energy in the everyday life of human being. It is thus important to have robust policy measures to achieve energy access for all. While the government plans for access to energy, some times that may result in creating policy and regulatory barriers to investors. The policies and programs were limited to targets and allocated budget which were successful in providing the initial 'push' but failed to achieve the utilization of the complete resource potential. Various policy and regulatory barriers are discussed in detail here.

5.2 POLICY BARRIERS

Policy framework for RE There is no single comprehensive policy statement for RE in the country[382]. Policies have been issued as and when necessary to facilitate the growth of specific rets. Further, the plans for development of RE do not match up to these policies. The Jawaharlal Nehru National Solar

[382] MINISTRY OF NEW AND RENEWABLE ENERGY, STATES WHICH HAVE NOTIFIED THE STATE SOLAR POLICIES, https://mnre.gov.in/file-manager/UserFiles/ state-solar-power-policies.htm (last visited Dec 4, 2018).

Mission (JNNSM), also known as Solar India, is inadequate to meet the target for RE generation mandated under the National Action Plan on Climate Change (NAPCC)[383].

The policy framework at the state level is no better. In fact, in many states policies have only created uncertainty for investments in RE. For example, in Madhya Pradesh, the policy for promotion of nonconventional energy sources waived wheeling charges and cross subsidy charge for renewable energy. The government will provide subsidies to distribution companies by way of wheeling charges at 4 percent of the prevailing energy charges384. Wind farms are exempted from electricity duty for a period of five years from the date of commencement of operations if the actual generation of electricity is at least 70 percent of the energy generation declared in the detailed project report. Thus, the conditions attached to the policy benefits make it uncertain for developers to avail the benefits declared by these policy documents.

Biomass plants face the challenge of sourcing the fuel from the locality. This is because of lack of clarity in the policy measures of various States with regard to the radius within which the Biomass plants can be established. multiple Biomass plants commissioned within the Limited radius affected the availability of fuel to each other. This has rendered those plans unviable since they had to procure the required fuel from faraway places.

Wind power has achieved exponential growth due to the accelerated depreciation of 80% of the capital investment made in the windmills. Corporates which had excess funds in the balance sheets took the opportunity to set up windmills without proper scientific studies[385]. The projects were

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[383] Vikas Khare, Savita Nema & Prashant Baredar, *Status of solar wind renewable energy in India*, 27 Renew. Sustain. Energy Rev. 1–10 (2013), https://www.sciencedirect.com/science/article/pii/S136403211300395X (last visited Jun 13, 2018).

[384] MINISTRY OF POWER, TARIFF POLICY-THE GAZETTE OF INDIA 1–21 (2006), http://powermin.nic.in/sites/default/files/uploads/Tariff_Policy_1.pdf (last visited Jun 13, 2018).

[385] *id*

mostly thus set up in low wind locations and became commercially unviable. Foreign investors on the other hand was reluctant to invest since the tax benefit of accelerated depreciation did not benefitted them. This in effect created inequitable conditions of investment for the foreign investors.

The tax incentive also made the wind power project investors at the last minute of the closure of the financial year, expecting to reduce the tax liability. Since the objective was only to save the payment of tax and the urgency to make investment before the closure of the financial year, the wind projects suffered from lack of planning and preparation in implementation. It has also resulted in the evolution of equipment manufacturers as project developers.

The suppliers of equipment generally carryout development activities such as acquisition of land, construction, Power Purchase Agreement finalization and transmission contracts. Equipment suppliers bought huge acres of land in in advance at the high wind potential sites and sold these lands to the investors/buyers the land along with the projects. Post commissioning, some of the equipment suppliers undertook operation and maintenance (O&M) of the same projects on behalf of the buyers. Thus, it so happened that the power projects were readymade projects and sold off the shelf by equipment suppliers. This created premium pricing for the wind power projects and became more expensive whereas the conventional fuels enjoyed financial support from the government by way of subsidies.

The push policy failed to create conducive market develop and renewable energy development mostly reminders Government induced programs rather than maturing into commercially viable products and services[386].

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[386] P. Venkata Ramana, C.S. Sinha & P.R. Shukla, *Renewable energy technologies and climate change policies in India*, 15 Int. J. Glob. Energy Issues 97–116 (2001), http://www.scopus.com/inward/record.url?eid=2-s2.0-0034956686&partnerID=40&md5=c08acc5bcdba9bfa968f0323f7b08342 (last visited Jun 11, 2018).

5.2.1 LACK OF ADEQUATE GOVERNMENT POLICIES

Even though renewable energy programs commenced as early as 1980 the lack of focused an adequate policy with reliability continuity and stability has entered the growth over the years. The government needs to bring comprehensive law and policy addressing all the aspects of renewable energy adoption creating an environment which promises adequate return to the investors. Even though the Solar Energy has reached grid parity in the year 2017, there requires more focus to develop improved technology through promoting research and development. India need policy measures directed at developing R&D in the sector[387].

Renewable based rural electrification programmes are not supported by adequate policy and legal frameworks. Instead is burdensome with requirements to be fulfilled for a small-scale producer[388]. It is also true the development in the sector happened only due to the policy support. Some authors suggest such policy support was the reason for development of renewable energy as it is today, and more innovative policy measures should be introduced to continue the support with changing circumstances[389]. Some feel that the Carbon Finance Mechanisms have the potential to promote the rapid expansion of solar market. The Clean Development Mechanism (CDM) could have been a success if the policy measures have adequately supported[390]. Policy incentives of premium for solar based cars could have been another policy measure.

The current policy instruments globally used to promote solar energy include feed in tariff (FIT), Investment tax credits, Subsidies, Renewable Energy Portfolio (RPS) or Purchase Obligation (RPO) and Renewable Energy Certificates (REC), Financing facilitation, Public Investment, Net Metering, Government Mandates

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[387] *supra* note 383 Khare, Nema, and Baredar.

[388] *supra* note 165 Bhide and Monroy.

[389] Govinda R. Timilsina, Lado Kurdgelashvili & Patrick A. Narbel, *Solar energy: Markets, economics and policies*, 16 Renew. Sustain. Energy Rev. 449–465 (2012), https://www.sciencedirect.com/science/article/pii/S1364032111004199 (last visited Jun 13, 2018).

[390] *Id.*

and Regulations and a combination of the above policies. One Successful policy example could be of Germany and Spain where the FIT guarantee attractive return on investment with 100% grid access and power purchase[391].

Sustainable Energy can be further developed only through the harmonization of research policy and energy policy[392]. Energy efficiency policies are another area to be focused and brought in consonance with the energy policy. There are multiple policy dimensions possible based on the priority of the government. Any policy shall address the energy trilemma and a market oriented policy may address it in a better way. Some authors have suggested that community based participatory planning could be the right way to approach by bringing all other stakeholders also under the same roof through consultation[393]. A carefully evolved and structured policy framework with national and international integration and coordination is required to transfer new technologies in the sector to the developing countries[394]. This fact underlines the need to create a global policy for further development of sustainable energy.

5.2.2 LACK OF POLITICAL COMMITMENT

Political commitment and vision is a major factor which drives the sector. Unless and until the political leaders demonstrate the political will true strong policies and legal measures the society and it's attitude towards renewable energy will not improve in a favorable direction. Political intervention lobbying by various interest groups and the resistance from the local population courses for the barriers for renewable energy adoption. An Empirical study conducted in some of the states in India shows how the

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391 *Id.*

392 Kamil Kaygusuz, *Energy for sustainable development: A case of developing countries*, 16 Renew. Sustain. Energy Rev. 1116–1126 (2012), https://www.sciencedirect.com/science/article/pii/S1364032111005491 (last visited Jun 13, 2018).

393 *Id.*

394 David G. Ockwell et al., *Key policy considerations for facilitating low carbon technology transfer to developing countries*, 36 Energy Policy 4104–4115 (2008), https://www.sciencedirect.com/science/article/pii/S0301421508003091 (last visited Jun 13, 2018).

political will can be instrumental in bringing successful policies and promote renewable energy in the state[395]. A recent study by NITI Ayog, also shows the performance of various states[396], which varies according to the political will and the policies the states have adopted.

5.3 REGULATORY BARRIERS

Regulatory barriers include those barriers in the regulatory framework for electricity and allied matters. Some regulatory measures adopted by various SERCs and state governments on various matters affect the renewable energy developments adversely. There are regulatory restrictions on open access third party sale since the SERCs restrict sale energy produced only to the state distribution licensees. Restrictions are also placed on the quantity of energy that can be uploaded to the grid due to the poor capacity of the grid to withstand the heavy load. All these barriers which are due to the regulations in place in various states and at national level are discussed in detail below.

5.3.1 REGULATORY FRAMEWORK FOR PROMOTION OF RE.

The varying disparities in the Renewable Purchase Obligations (RPO) by various SERCs are a major regulatory challenge faced in the promotion of renewable energy. There is no consensus for a nationwide single RPO for various states. This is primarily because of the overall conditions of each state is different from the other. It is also argued that there should be technology specific RPO mandate throughout the nation.

If a technology-specific RPO is specified and there is limited availability of a specific RE source within a year, will SERC allow such a shortfall in the RE repository to be met by another type of RE source? Otherwise, concerned DISCOMs may have little incentive to explore other RE sources; Other RE sources are the indirect limitation of investments.

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395 *supra* note 169 Schmid.

396 *supra* note 319 State Renewable Energy Capacity Addition Roadmap.

If DISCOM is able to meet its RPO through SETC-specified RETS / RE sources, it should not be liable for penalties for non-achievement. Another issue is the RPO level. SERCs should carefully determine the RPO level. A high RPO target encourages DISCOMs to buy more RE energy, thereby promoting investments, such that goals may be ambitious in the short term[397]. On the other hand, a lower target may impose a discomfort on the energy purchased by DISCOM from RE sources.

This is the case in Gujarat, where it has been reported that discoms have stopped signing fuel purchase agreements with wind developers (2.28% as mandatory 2% for 2007-08).[398]. In addition, current discoms have little incentive to exceed their RPO. Finally, some states such as Maharashtra, Gujarat, Madhya Pradesh and Karnataka do not allow RE to collect power from outside the state[399]. This is detrimental to the overall development of the RE in the country. The application of Section 86 (1) (e) of the EPA 2003 RPO provides the RPO specification on the use of a range of discoms. This implies that the RPO should be applied over the entire use of the discoms area and not the energy from the discoms alone. Currently, only Maharashtra, Rajasthan and Andhra Pradesh impose RPO on open access (OA) and captive customers[400].

RPO Enforcement To date, only a few states, such as Rajasthan and Maharashtra, have imposed penalties on issuers of licenses if the RPO is not met. In Rajasthan, the penalty is called the RE surcharge and must be paid to the State Transmission Utility (STU). The additional fees thus raised will be funded to be used for the creation of RE plants' dispersal system infrastructure.

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[397] *supra* note 169 Schmid.

[398] Mohit Goyal & Rakesh Jha, *Introduction of Renewable Energy Certificate in the Indian scenario*, 13 Renew. Sustain. Energy Rev. 1395–1405 (2009), https://www.sciencedirect.com/science/article/pii/S1364032108001470 (last visited Jun 13, 2018).

[399] *Id*

[400] *Id*

So far, there have been some instances where distributors (discoms) have been penalized for not performing Arposhev. So far, only the Maharashtra Electricity Control Commission (MERC) has fined Maharashtra's discoms for not fulfilling mandatory RPS.[401] In the financial year 2007-08, MERC has introduced enforcement charges for the deficit at the rate of 5.00 / kWh, 6.00 / kWh in 2008-09 and 7.00 / kWh in the financial year 2009-10. It was further clarified that this enforcement fee, when approving the DISCOM's Annual Revenue Requirement (ARR), would not be allowed as a passing expense.[402].

The role of FITS / tariff orders provides an analysis of the impact of the sound regulatory framework on RET intelligent capacity at the state level. The table maps the RET intelligent capacity additions with tariff orders / fits. Almost all biomass and wind are potential additions in states that have determined FIT. In the case of small hydroelectricity, about 83.4% of capacity is added in states that have issued tariffs[403].

While the determination of FIT is one aspect of the regulatory framework, the adequacy of this FIT is another important factor to be addressed. TNERC, in May 2006, decided on FIT for wind at ` 2.9 per unit in 2006. This tariff was often perceived as inadequate and was reflected in the speed with which wind energy was added to the state. The state added 858 megawatts of wind capacity in 2005-06, while capacity additions dropped to 577 megawatts in 2006-07 and 381 megawatts in 2007-08[404] . TNERC, in March 2009, issued FIT ` 3.39 / unit for windmills deployed after April 1, 2009. Another case of inadequate FIT can be found in the AP [405]. FIT ceiling tariff as decided by the

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401 *Id*

402 *supra* note 319 State Renewable Energy Capacity Addition Roadmap.

403 *Id*

404 T V Ramachandra, Rishabh Jain & Gautham Krishnadas, *Hotspots of solar potential in India*, 15 Renew. Sustain. Energy Rev. 3178–3186 (2011), http://www.ces.iisc.ernet.in/energy/paper/hotspots_solar_potential/RSER_hotspots.pdf (last visited Jun 5, 2018).

405 *Id*

Andhra Pradesh Electricity Regulatory Commission (APERC) in 2004. As a result, the discoms in the AP tended to get electricity from the RE projects at a lower rate than that set by the APERC. Because these tariffs were not financially viable, several developers abandoned their investment plans. To illustrate this point provides an overview of the inclusion of wind power potential in the AP.

Many SERCs use tariffs as proxies instead of working on a cost-effective basis. For example, of the 9 SERCs that issued tariff orders for solar PV-based power generation, only 2 gave details of the parameters used for determining tariffs (Chhattisgarh and Uttar Pradesh). Some SERCs have taken the tariff of other RE technologies in the state as a reference point and added the level of subsidy (as declared by MNRE) to arrive at the tariff for solar PV based IPPPS (West Bengal). Similarly, there are SERCs that have provided details of parameters used for determination of FIT of some other rates. There are two issues here. First, if the FIT does not reflect the underlying costs, no capacity additions are made. Secondly, subsidies - where MNRE is declared - are paid for a limited time; FIT beyond that is inadequate. Finally, many SERCs determine fits for a limited time. For example, the West Bengal Electricity Regulatory Commission (WBERC) has fixed FIT for five years from the date of implementation [406]. This FIT is clearly inadequate as the lifetime of power plants is 20 years, leading to regulatory uncertainty and impact on project bankability. For any project developer and lender, it is important to know the project revenue flow in advance, at least for the duration of the loan service (10-12 years). Although the CERC has issued rules on the terms and conditions of determining tariffs for various countries, many states are yet to adopt CERC tariffs [407]. Many states and developers have argued that the tariff standards adopted by the CERC are inadequate.

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406 M. Felix, *Enhancing the Investor Appeal of Renewable Energy* 42 ENV. L. 681-734 (2012).

407 CENTRAL ELECTRICITY AUTHORITY, CENTRAL ELECTRICITY AUTHORITY NEW DELHI EXECUTIVE SUMMARY POWER SECTOR 1–52 (2014), http://www.cea.nic.in/reports/monthly/executive_rep/feb14.pdf.

For example, in the case of solar projects, the CERC does not differentiate between PLF / location or technology. PLF varies across locations / regions and technologies. The same is true of wind projects. Therefore, he argued for a review of the CERC's one-size-fits-all tariff framework. The regulation and the impact of fits deserve particular mention in the context of SHPs. Almost all states determine the cost and tariff for SHPs. As a result, to ensure higher returns through higher tariffs, developers are not increasing capital expenditures or allowing capital expenditures to be reduced.

The sale of a third party by section 39 of the 2003 Act directs the State Government to establish the STU, which must have a transmission network in the state and provide non-discriminatory free access (OA) to its network. Section 42 of the Act provides for non-discriminatory OA to its distribution network for eligible customers when they pay wheeling fees and other applicable surcharges.[408]. It is embedded in the regulatory framework in many states. However, state sources are hesitant to allow OA to RE sources. In fact, it has been seen on many occasions that distribution utilities are resentful of RE power exports to other states and are trying to block OA to RE based generators in order to force this power to be sold to state utilities at a fixed price.

In some states, OA for RE generators is limited to low-tariff customer categories. For example, in Gujarat, although the state's wind power policy allows third party sales (TPS) to any customer in the state, practically the RE generators can sell electricity only to industrial customers and not to commercial customers.[409]. Commercial customers have higher tariffs than industrial consumers and the state does not want to lose more paying customers to OA. In this type of case, developers / investors have no incentives through dividend to serve industrial customers. Apart from the

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[408] *supra* note 175 Chatterjee.

[409] Government of Gujarat, GUJARAT SOLAR POWER POLICY 2015, https://mnre.gov.in/ file-manager/UserFiles/state-power-policies/Gujarat-Solar-Power-Policy-2015.pdf (last visited Dec 4, 2018).

above problem, due to the unpredictable nature of such a generation, states are obliged by OA to cite difficulties in scheduling[410].

In addition, although RE can be produced with 70%, utilities demand generation capacity with 90% probability. Another problem is the absence of firm policies or regulatory frameworks for wheeling fees for RE. The Madhya Pradesh case has already highlighted the lack of regulatory certainty over wheeling fees for OA in the case of RE. In the case of SHP, TPS is not viable after considering wheeling charges and free electricity for the state government.

The energy industry has a small number of players that create a monopoly on several levels, and such monopolies are highly concentrated and unacceptable for distribution technologies such as solar. Such monopolies create institutional barriers and lead to policy barriers because most policies are created around it. This requires the formulation and modification of policies and laws for the integration of renewable energy with the existing power system.

Providing adequate protection for intellectual property rights promotes research and development in the field. Intellectual property laws must be strengthened. Proper allocation of financial assistance from the government, investment friendly regulations, liberalized market policies etc. Could promote the progress of the renewable energy sector.

5.4 LEGAL BARRIERS

The foundations of energy law lie in the interaction between petroleum industry and the law[411]. Even after a century there was no International consensus on a unified harmonised petroleum law at the international level. This is due to disconnect between various legal and institutional frameworks

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[410] Daljit Singh, Newer Challenges for Open Access in Electricity Need for Refinements in the Regulations 6 (2017).

[411] Tedd Moya Mose, *Toward a harmonized framework for international regulation of renewable energy*, Advance Ar Unif. Law Rev. 1 (2018), https://academic.oup.com/ulr/advance-article/doi/10.1093/ulr/uny016/4992864 (last visited Jun 11, 2018)

governing the energy sector[412]. The incoherence and Lack of uniformity existed in the petroleum sector at the foundations of the energy law is transplanted with the same philosophies to the renewable energy sector as well[413]. The reasons for the incoherence in the laws was since the law was primarily governed by the administrative mechanisms of the governments. The supply of electricity was considered as a sovereign function under the Electricity Act 1948[414]. This situation has dwarfed the development of the jurisprudence in the sector.

There are more private investments and private players involved in the renewable energy sector. The involvement of more private parties increases the disputes which makes it necessary to develop strong jurisprudential foundations for the sector. The governments still consider the provision of electricity is their prerogative as a sovereign function and continue to issue directions as it used to do while the sector was directly under the control of the government.

Researchers in the field has proposed three pathways which are complementary to each other for the development of an international energy law different from the existing based on the philosophies that suit the present conditions[415].

1) Development of International Energy law to govern our energy resources
2) Renewable energy law framework is developed using the energy trilemma[416]

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412 *Id.*

413 *Id.*

414 Rajasthan State Electricity Board v Mohan Lal and Others. 1967 AIR 1857

415 *supra* note 406 Moya Mose.

416 Boris Lopicich, *Equity and the energy trilemma Delivering sustainable energy access in low-income communities*, Equity energy trilemma Deliv. Sustain. energy access low-income communities 26–36 (2015), http://pubs.iied.org/pdfs/16046IIED.pdf (last visited Jun 13, 2018).

3) Elevate existing renewable energy law principles and practices into mainstream international law

The current international renewable energy framework can be further classified as the hard law and soft law. The hard law on international renewable energy law include-

The soft law international renewable energy law include-

1) International Energy charter
2) Rio declaration on environment and development
3) Johannesburg declaration
4) Sustainable energy for all initiative

5.4.1 RENEWABLE ENERGY AND DEVELOPMENTS IN LAW

Geo thermal and hydroelectric power will fall under the sovereign jurisdictions on natural resources since these resources r connected with land. Can a state claim permanent sovereignty over the flow of wind over their Territory or rays of sun? Some authors dean solar energy as *res communis*- for the enjoyment of all. Others dim it as a part of the bundle of benefits derived from the use of natural environment which falls under the powers of the states sovereign authority. The United Nations also have mid expression energy resources weekly in the resolution on permanent Sovereignty over natural resources.

5.4.1.1 Sovereignty over natural resources.

Extending the principle of permanent sovereignty[417] over natural resources to the renewable energy sector may hinder the development of renewable energy. The geopolitical reality has moved towards cooperation rather than state

[417] G.A. Res. XVII/1803, ¶ 29 PERMANENT SOVEREIGNTY OVER NATURAL RESOURCES (Dec. 14, 1962)

control over natural resources. This lack of clarity makes it necessary to have an hour walking International law and regulation for renewable energy sector.

In India the sovereignty ultimately resides in the people where the principle *res communis*also rests. Renewable energy law need to be normative and based on consistent principles mainly due to the existence of energy trilemma[418].

Different laws to deal with different sources of energy will be problematic. So it is important to have a Framework which can accommodate all sources of energy. This is the basic preposition to recommend for an international renewable energy law incorporating doctrinal and practical Pathways.

There is no International Treaty specifically regulating renewable energy. The International Love in this subject consists of a mixture of legally binding applications and other instruments that could develop a global energy law and policy.

The trade aspects applicable in case of renewable energy outlined in the general agreement on tariffs and trade, WTO agreement on trade related investment measures and general principles and the WTO governing international trade are currently the major regulatory Framework at the international level.

There is a need for establishing renewable energy logos on the foundations of international law. Some authors prescribes energy trilemma as the substantive and methodological prism for designing the international renewable energy law framework[419]. Energy trilemma addresses political economic and environmental challenges while formulating the renewable energy law.

EA challenge in the trilemma is dealt by analyzing the specific problems involved in and the rationale for legal and policy intervention[420]. It is also important to

[418] International Energy Agency, INTERNATIONAL ENERGY AGENCY ANNUAL REPORT (2012), https://www.iea.org/publications/freepublications/publication/2013_AnnualReport.pdf (last visited Jun 13, 2018).

[419] *supra* note 406 Moya Mose.

[420] *supra* note 410 Boris.

create International Energy markets for the development of the sector. The International Energy market integration of national markets is possible when the domestic soft law comprising of principles and practices conforms to an International standard. This can be done only by mainstreaming soft Law principles on renewable energy at International law level.

Petroleum law developed along with the industry based on the contracts interpretation of those contracts the commercial practices and weed is arbitral awards. Petroleum law varied in principle practices and content from country to country and was best perceived as a branch of National Law rather than international law. Where is renewable energy development is important globally due to climate change and every Nation on earth is concerned about how any other nation is consuming energy and the level of pollution contributed by them. Thus there is an international law aspect where every nation of a duty to another Nation to gradually shift to clean our ways of energy production and consumption

The major challenge is using the existing International platforms like the United Nations to negotiate and formulate and international Energy law while the key stakeholders are private players. The authors suggest the ideal mechanism as harmonization of International Energy law and measuring the regulations through the prism of energy trilemma and giving greater credence to the energy regulation evolved through soft law.

Renewable energy is are currently the cleanest energy source available on Earth but they do not satisfy that test under the energy trilemma regarding affordability and stable availability.

The investment choices in any sector will be influenced by cost, benefits, revenue, profit, and availability of finance. The same factors influence investments in renewable energy sector. But one advantage of an energy installation is that it usually create natural monopolies due to highly expensive Investments and lack of competitor in particular locality[421].

There exist dichotomy between profit maximization and environmental benefit. Environmental finance firms focus on low cost Investments and benefit to largest number of people[422], whereas Investments are huge in renewable energy sector and the direct beneficiaries are few.

There is no finance policy specifically for sustainable environment and there is no finance policy for renewable energy[423]. Since there is lack of search policies it is the Economics of finance which determine the investment decision. The dichotomy existing in both the sectors makes it difficult for someone to invest in Renewable Energy infrastructure within environment objective.

If financing regimes operate based on traditional models of finance driven by profit motive, The chances of fund flows getting attracted into renewable energy sector is lowest. The traditional debt and equity methods of Financing projects without considering the environmental cost expects lowest cost and maximum return, which is lacking in renewable energy sector.

Where one of the greatest threat to humanity and the existence of life on earth is posed by climate change, there lacks and international legal framework for developing sustainable energy. There is a common goal of need of embracing sustainable energy sources is a sufficient ground for international agencies to focus on developing an International Energy law.

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421 Rick van der Ploeg & Cees Withagen, *Is There Really a Green Paradox ?* CESifo Working Paper Series No. 2963 1–38 (2010).

422 Andrea S. Kramer & Peter C. Fusaro, Energy and environmental project finance law and taxation : new investment techniques, https://store.lexisnexis.com/products/energy-environmental-project-finance-law-taxation-skuusSku-us-oxf-04610-Hardbound (last visited Jun 11, 2018).

423 Yannick Glemarec, *Financing off-grid sustainable energy access for the poor*, 47 Energy Policy 87–93 (2012).

The withdrawal of United States of America from the Paris agreement suggest the need of more stronger renewable energy law making countries bound to create environment sensitive policies in the energy sector.

The lack of harmonized international renewable energy law creates the need for an International Energy law overarching all sources of energy.

5.4.2 LACK OF PUBLIC INTEREST LITIGATIONS

Public interest litigations reflect the thoughts of the society and the judiciary about a particular issue. Public interest litigations brings to the forefront and to the attention of the general public some important aspects which the society as a whole need to consider and address. Sometimes where the government, the society and the business community fail to address issues properly[424]. In such situations publicly spirited citizens take charge of things and bring the matters of concerns before the Supreme Court and high courts for issuing directions to the government as well as other stakeholders through Public Interest Litigation. There need to be more public interest litigation in the field of energy consumption, energy conservation and pollution due to fossil fuels. Public interest litigations will attract the attention of media, public and governments. It will help the people to think in the direction to address the problem and create the public awareness in a better way.

5.5 INSTITUTIONAL BARRIERS

Inter-organizational coordination Lack of coordination and coordination among and across various ministries, agencies, agencies and other stakeholders will delay and impede progress in RE development[425]. One example is the implementation of the GBI announcement for wind projects by MNRE. Soon after the announcement of the scheme, Ireda began accepting

[424] Yerramsetti, V.S., Sharma, A.R., Navlur, G.N., Rapolu, V., Dhulipala, N.S.K.C. and Sinha, P.R., *The Impact Assessment of Diwali Fireworks Emissions on the Air Quality of a Tropical Urban Site, Hyderabad, India, during Three Consecutive Years*, 185 ENVIRON. MON. ASSESS. 7309-7325. (2013) https://doi.org/10.1007/s10661-013-3102-x

[425] Fredric Beck & Eric Martinot, *Renewable Energy Policies and Barriers*, 34 Encyclopedia of Energy 365–383 (2004), http://www.martinot.info/Beck_Martinot_AP.pdf.

applications from wind projects under the GBI scheme. However, GoI has rejected applications made before the notification of the project through the Gazette and is only considering applications made after such notification. Although this assertion is in principle grounded, it is not necessary to begin receiving applications prior to notification through the IREDA Gazette. Such gaps in the implementation of policies in the absence of inter-institutional coordination can diminish investor confidence in the investment environment for RE.

5.5.1 LACK OF SINGLE WINDOW CLEARANCE SYSTEM

Several states have implemented a single window project approval and clearance system for RE. These include Punjab, Himachal Pradesh, Haryana, Rajasthan and Uttarakhand. However, the effectiveness of this system is questionable. This problem is sometimes compounded by the fact that delays in obtaining approval for projects offered through competitive bidding (such as SHP) can lead to the developer being fined. [426]. Punjab is one of the few states where the system is upheld (setting a 60-day period specified by Punjab) and RE developers are not required to comply differently with state government departments.

There is a lack of uniformity in the country with regard to counters and offices and departments, in which investors will eventually have to set up their own solar plant. Permissions and permissions have similarities but processes and procedures and forms change[427]. Some states have established a single window clearance system for setting up power plants, but the efficiency of such offices is very poor due to lack of internal coordination between the various state government departments for processing applications. , According to some investors.

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[426] Akash Kumar Shukla et al., *Solar PV and BIPV system: Barrier, challenges and policy recommendation in India*, 82 Renew. Sustain. Energy Rev. 3314–3322 (2018), http://linkinghub.elsevier.com/retrieve/pii/S1364032117313862 (last visited Jun 12, 2018).

[427] *supra* note 422 SUMMARY OF STATE POLICIES.

5.6 FISCAL AND FINANCIAL BARRIERS

Fiscal and financial barriers are those barriers which are creating the challenges to the investors in terms of mobilizing the capital and also in terms of generating revenue. If there exists barriers in cash flows and revenue generation the investors will find the sector unattractive for investment. Various fiscal and financial barriers are discussed in detail below.

5.6.1 BUDGETARY CONSTRAINTS

The Government of India has announced Generation Based Incentive (GBI) for wind, roof top PV and for solar power plants that do not qualify under the JNNSM and sell to the state utilities. For solar power projects in the capacity range of 100 KW to 2 MW connected to a HT grid below 33 KV are given the benefit. This makes the government to find additional funds to finance the power generation incentive. It may not be an ideal situation for the government to have many developers falling in the eligible category claiming huge amount of incentives over and above the SERC set tariffs. In a worst case scenario of low cost reduction for renewable energy from a budgetary exposure for the Government of India perspective, the year wise GBI per kWh reduces from ` 2.12/kWh to 0.36/kWh from 2015-16 to 2021-22 in case of solar PV[428]. In a best case scenario of lowest incremental costs from a higher coal prices the absolute payments to be made by government of India for solar and wind combined will be 177 crore in 2015-16, and 1768 crore in 2018-19. Which is estimated as high as 8,359 crores in the worst case scenario for the year 2020-21[429].

5.6.2 LACK OF FINANCING OF RE PROJECTS

There is lack of government incentives schemes and financing mechanism to promote Renewable Energy Technologies (RETs)by businesses and

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[428] *supra* note 85 National Institution for Transforming India.

[429] *Id.*

industries[430]. The poor availability of credit for the purchase of renewable energy technology is a major barrier to the slow growth of the renewable energy sector.

RE projects face many difficulties in financial matters. In general, the development of RE faces difficulties in obtaining competitive forms of financing due to uncertainties related to technology know-how, risk perception and resource evaluation.

These are described below: RE projects have little or no energy costs and lower operating and maintenance (O&M) costs, but their initial unit capital costs are higher than fossil production systems. High ratios of capital expenditures to O&M costs are significant because they indicate that these projects have an unequal burden of initial burden that must be financed over the life of the project[431]. This makes exposure to risk a long-term challenge (which also has policy and regulatory-risk implications).

The risk of not providing subsidies is also significant because of the limited or unavailability of resources with the government because these subsidies may be the lifeblood of the project. The generally small nature of RE projects can lead to lower gross returns, although the return rate may well outweigh the market criteria that are considered attractive investment. The developers of RE projects are usually small, independent and newly established developers with a lack of corporate track record and financial inputs. So lenders perceive them as high risk and hesitate to provide unhelpful project financing[432]. They would like to see experienced construction contractors, suppliers and experienced operators with proven equipment.

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[430] Jeremiah Doner, *Barriers to Adoption of Renewable Energy Technology*, Inst. Regul. Policy Stud. Illinois State 32 (2007), http://irps.illinoisstate.edu/downloads/research/documents/IRPSDonerWorkingPaper050707.pdf.

[431] *supra* note 421 Shukla et al.

[432] Sunil Luthra et al., *Barriers to renewable/sustainable energy technologies adoption: Indian perspective*, 41 Renew. Sustain. Energy Rev. 762–776 (2015), http://linkinghub.elsevier.com/retrieve/pii/S1364032114007631 (last visited Jun 11, 2018).

Some RETs are newly commercialized and subsequently not widely known among lenders (although this is changing rapidly). This leads to misinterpretations of risk in relation to these schemes among lenders, making financing difficult. The intermediate generation characteristics of the RETs may put them at a disadvantage when it comes to creating contracts for power transmission compared to conventional power projects. For small and local developers who want to implement RE projects, lack of funding to meet working capital requirements prevents equipment O&M. The development and operation of small-scale RE projects involves business and financial risks just like any other business. The difference in earnings and therefore does not motivate many local entrepreneurs to engage in such projects in return for equity investors. Documents and soft costs associated with identifying and obtaining financing for small and medium-sized RE projects are high compared to financial needs[433]. Issues related to performance or low PLFs and uncertainties inherent to such projects (such as hydrology or wind-mediated winds) are a barrier to project financing. Because any delay in payments through the off-taking state utility has a direct impact on the credit service, lenders generally prefer credit enhancement procedures such as a credit service reserve account (DSRA) or bank guarantee (BG), which may exceed the capacity of small and local developers.[434]. Limited knowledge / expertise on RE in financial institutions serves as a barrier to the financial system.

5.6.3 LACK OF SUBSIDIES

For many years the competing fossil fuels in India where heavily subsidized through administrative pricing mechanism which was dismantled in the recent years. The petroleum products for domestic use suggest LPG kerosene etc. Are subsidised event today. The subsidy given to competing fuels and lack of

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[433] *supra* note 388 Timilsina, Kurdgelashvili, and Narbel.

[434] *supra* note 417 Glemarec.

subsidy for renewable energy makes it difficult for renewable energy technology to penetrate the market by creating a customer base[435].

5.7 MARKET-RELATED BARRIERS

Most of the renewable energy technologies are research developed and patented in advanced industrialized economies. Importing search technology, knowhow, and equipment requires hi initial investment. The land requirement for renewable energy Technologies are usually very high increasing the initial capital investment[436]. The investors in the energy sector prefer low cost initial investment to achieve a higher rate of return and leisure break even period.

The central electricity regulatory Commission has notified the terms and conditions for determining tariff for renewable energy from time to time. The lifespan of solar panels are considered as 25 years for the purpose of tariff calculation.

Ministry of power, Government of India issues tariff Policy under section 3 (1) of the Electricity Act 2003. The Central electricity regulatory Commission and State Electricity regulatory Commission are guided by such tariff policy while fixing tariff. The government has formulated the electricity tariff policy 2006 after consultations with state governments and Central electricity authority[437]. The general approach tariff in the said policy is to introduce competition in different segments of electricity industry in continuation of the regime envisaged under Electricity Act 2003[438]. The policy recommends that a balance need to be maintained between the requirements of return on investment and Consumers interest. It also suggest that return on investment should be ensured to attract Investments. It directs to ensure that the rate of

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435 Union of Concerned Scientists, *Barriers to Renewable Energy Technologies*, Powerful Solut. 1–9 (2017), http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/barriers-to-renewable-energy.html#.WSVJHGgrKMo.

436 *supra* note 429 Luthra et al.

437 MINISTRY OF POWER, TARIFF POLICY THE GAZETTE OF INDIA 1–21 (2006), http://powermin.nic.in/sites/default/files/uploads/Tariff_Policy_1.pdf (last visited Jun 13, 2018).

438 *supra* note 175 S. K. CHATTERJEE.

return should be reasonable and enough surplus to be produced for the growth of the sector according to the policy.

The Other factors which need to be taken into consideration for fixing tariff include the debt equity ratio, depreciation, cost of debt, cost of management of foreign exchange risk, operations cost at normative levels, cost of renovation and modernization extra will be taken into consideration. The policy also suggest that the State Electricity Regulatory Commissions shall fix minimum percentage for renewable purchase obligation under section 86(1)(e) of the Electricity Act 2003 and the distribution companies share procure electricity at preferential tariff determined by appropriate Commission. It also direct that switch procurement should be done for future requirements through competitive bidding process under section 63[439]. The objective is to make the new renewable energy Technologies to be competitive with conventional sources of energy in the long term.

Considering the in high initial capital investment requirement the tariff policy suggest a higher tariff for renewable energy. This increases the cost of electricity produced from Renewable Sources which makes it an attractive to distribution licensee. This discourage them from procuring energy beyond the renewable energy purchase obligation. So even as per theory the sectors should develop to the extent of the renewable purchase obligation of various discounts in various States depending on the RPO target[440]. But many states have failed to meet their renewable purchase obligation by purchasing less than their determined target. There were instances where states like Assam revised their renewable energy obligation and reduced it. This and attractiveness is mainly due to the initial capital investment requirement which impacts the deployment of renewable energy sources in particular states and the high cost of electricity at the initial years to make the investment break even.

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439 Electricity Act 2003, No. of 2003

440 *supra* note 388 Timilsina, Kurdgelashvili, and Narbel.

Economic feasibility being considered as a determining factor for supply of energy requirements may not stay for long as energy resources are scarce and price inelastic. When conventional sources of energy start deplete and become scarce, the prices also will go up.

5.7.1 LEVEL PLAYING FIELD FOR RE

Structure of current subsidies in the power sector, where subsidies are effectively provided to conventional fossil fuel resources. These provide an unfair advantage over conventional fuels, giving the impression that the difference between conventional energy prices and RE-based energy is too high[441].

5.7.1.1 Market for RE

The market for RE projects/products in India can be classified into four segments:

i. Government Markets: where the government purchases the output out of projects as consumers, often with budgetary support.
ii. Government driven market: For social reasons the government pursues the use of RE in organizations outside its control, often providing budgetary support or financial incentives. For example, the government promotes the use of solar applications in schools, malls and hospitals.
iii. Debt market: People are financing RE based applications because self-financing is limited
iv. Cash Market: High Net worth Individuals (HNIs) can purchase RE based applications to meet individual energy needs. India is currently in the early stages of the first two divisions.

The Indian government is not focused on promoting the third and fourth classes of RE, which makes it more capable for RE-based applications. Fuel costs for biomass Biomass based projects, unreliable biomass supply, non-existence of an integrated fuel market and frequent price fluctuations threaten project viability. In the early 2000s, biomass costs were low (300-400 per

[441] RAJYA SABHA, PARLIAMENT OF INDIA DEPARTMENT-RELATED PARLIAMENTARY STANDING COMMITTEE RAJYA SABHA ONE HUNDRED TWENTY SECOND REPORT EASE OF DOING BUSINESS (2015), http://164.100.47.5/ newcommittee/reports/EnglishCommittees/Committee on Commerce/ 122.pdf (last visited Jun 6, 2018).

tonne) in most states. Over the years, increased demand for biomass for power generation and alternative uses has caused demand-supply gaps in the sector and has led to increased biomass prices. The type of biomass available varies from state to state and makes alternative uses for biomass. For example, in Andhra Pradesh, the rice bran fisheries industry uses it for packaging purposes for export purposes. But the large biomass substitutes the SME sector for heating coal (operating boilers), cattle feed, and rural areas for domestic use. The availability of biomass and coal in a state determines the change in the price of biomass. For example, coal is abundantly available in hattis, and the cost elasticity of biomass is very low compared to coal, with no transportation cost. The price of biomass is ` 1615 per metric compared to the coal price of ` 2100 per metric (including transportation costs).[442].

On the other hand, due to their geographical location, the northern states of Punjab and Haryana have a critical constraint on the supply of coal to small scale industries, so biomass demand and price elasticity are very high. Biomass prices in these states have reached ` 3500 per tonne. It could be argued that the efficiency of biomass-based power projects has increased significantly in both these states. While that is true, the alternative use of such biomass is also high. For example, the sheer volume of stored wheat stems is used as livestock feed in both states.

5.7.2 INADEQUATE MARKET PRICES

The cost of RE energy is determined on a cost-plus basis in order to ensure cost recovery for RE projects. The price does not reflect environmental costs, thus obscuring the significant environmental benefits of new and switched energy options. Invariably, carrying out the life cycle assessment cost of fossil

[442] International Energy Agency, INDIA ENERGY OUTLOOK-WORLD ENERGY OUTLOOK SPECIAL REPORT 2015 (2015), https://www.iea.org/publications/ freepublications/ publication/IndiaEnergyOutlook_WEO2015.pdf (last visited Sep 12, 2017).

fuels and RETs can be said to help reduce the gap between fossil fuel-based electricity and RE energy prices [443].

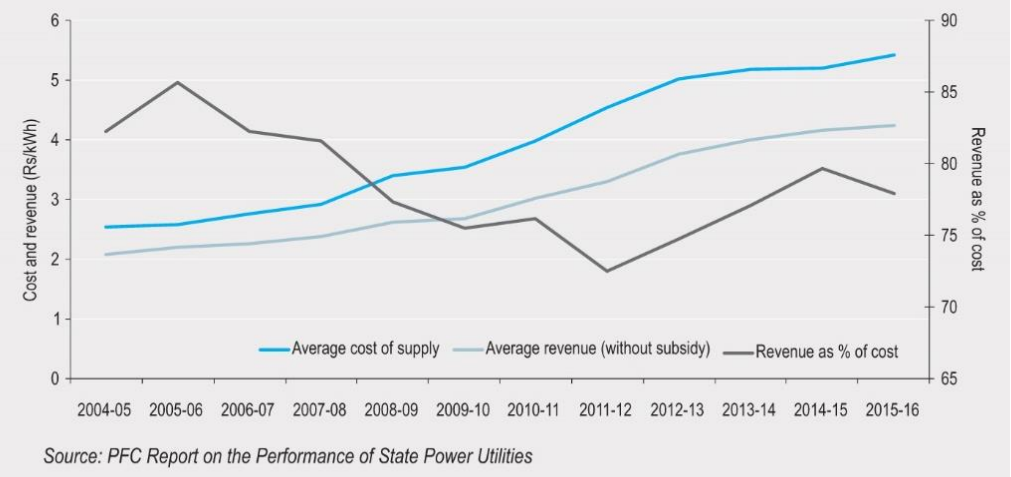

Fig. 5.1: Average Cost of Supply and Average Revenue of State Power Utilities

The average cost of power supply has been increased from 2.54 per kilowatt to 5.43 per kilowatt-hour over a decade from 2004-05 to 2015-16. Average revenue increased from 2.09 per kilowatt to ` 4.23 per kWh[444]. In August 2018, the solar rooftop cost ` 1.58 per kilowatt. The developers have made a bid to build solar projects at the auction of government and private buildings at auction in Madhya Pradesh[445].

5.7.3 TRANSMISSION NETWORK

Availability of evacuation infrastructure and grid integration are major issues affecting the development of RE projects, especially in remote areas where SHP projects or wind projects have limited or no evacuation infrastructure. While states must provide the infrastructure to relocate power from RE projects, in practice the RE developer must provide such infrastructure. This will affect the cost of the project. Even if states provide relocation infrastructure, such infrastructure is inadequate. In fact, instances of scaling

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[443] *supra* note 427 Doner.

[444] I.C.R.I.E.R., REPORT ON INDIAN URBAN INFRASTRUCTURE AND SERVICES, http://icrier.org/pdf/FinalReport-hpec.pdf (last visited Jun 6, 2018).

[445] *Id*

down of RE projects due to inadequate evacuation infrastructure have come to light. For example, Sai Engineering's 20 MW project at Toots of Kullu (HP) was scaled to 10 MW due to lack of adequate evacuation infrastructure. Similarly, Tamil Nadu was unable to utilize all the energy generated by the wind due to lack of adequate evacuation capacity in 2007-08[446.] It had to consequently buy more expensive power from other states to meet its needs.

The small size and ality threshold of many RE projects add another dimension to the problem because the size of the project does not adequately justify the economic viability of extending the transmission lines to such projects. Nevertheless, the problem needs to be adequately addressed[447]. The development of evacuation infrastructure and linking the grid to the RE sources are considered to be the responsibility of the transmission utility. However, distribution licensees have an important role in shifting RE production, as many RE sources are connected to distribution voltages. The Forum of Regulators (FOR) has noted that barring few utilities, such as Maharashtra State Electricity Transmission Company Ltd. (MSETCL), Rajasthan Vidyut Prasaran Nigam (RVPN) and Himachal Pradesh State Electricity Board, others have not included evacuation infrastructure for RE as part of their overall transmission or distribution capex plans[448]. Even for these utilities, the lack of funds to embody such projects is a major issue. It is also understood that utilities are not well aware of RE-based power evacuation transmission requirements.

5.7.4 TRANSMISSION AND DISTRIBUTION LOSSES

The location of generation and consumption very in the case of electricity. The inefficient transmission lines may cause Transmission and distribution losses. Improved infrastructure is a basic necessity for evacuation of intermittently produced renewable energy to the national grid with least

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[446] *supra* note 388 Timilsina, Kurdgelashvili, and Narbel.

[447] I.C.R.I.E.R., REPORT ON INDIAN URBAN INFRASTRUCTURE AND SERVICES, http://icrier.org/pdf/FinalReport-hpec.pdf (last visited Jun 6, 2018).

[448] *supra* note 251 20 January.

amount of Transmission loss[449]. An increase in the difference of electricity produced and consumed results in revenue loss for the renewable energy producer[450]. Acute power shortages are a regular phenomenon in some parts of India even after having an installed capacity exceeding the demand. This is mainly due to the poor infrastructure causing excessive Transmission and Distribution losses (T&D)[451]. It is suggested to improve the condition by policy intervention at various levels. Upgradation and digitization of transmission and distribution grid, Advanced Metering Infrastructure deployment by utilities and High Voltage Direct Current (HVDC) for long distance transmissions are expected to reduce the T&D losses[452].

5.7.5 HIGH EQUIPMENT COSTS

It is generally believed that technology levels and advances reduce the cost of capital. However, this is not always true. There are many examples of this - the automobile sector is perhaps the best example. Similarly, the capital expenditure of commercially deployed rents has not decreased over the years despite the increase in capacity. On the contrary, it has been observed that developers or equipment providers are quoting rising capital costs over the past few years. For example, a trend based on the movement of capital expenditures for wind projects funded by IREDA for the period 2004-05 to 2008-09 indicates that average capital expenditures range from ` 4.79 Cr / MW to 76 5.76 Cr / MW14 for several reasons., Due to exports, insufficient capacity in the Indian RE equipment industry, and the cartelization of equipment suppliers, there is a large gap in demand supply. As a result, electricity costs from these rents remain high.

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[449] Hiroaki Nagayama, *Impacts on investments, and transmission/distribution loss through power sector reforms*, 38 Energy Policy 3453–3467 (2010), http://linkinghub.elsevier.com/retrieve/pii/S030142151000100X (last visited Jun 13, 2018).

[450] *supra* note 421 Shukla et al.

[451] *supra* note 85 National Institution for Transforming India.

[452] *supra* note 82 Ahluwalia, Gupta, and Stern.

A grid-connected solar power plant can cost between ` 50,000 and ` 70000 per kWh. The cost of setting up an off-grid plant is ` 1 lakh per kWh [453].

5.7.6 INPUTS FOR RE PLANTS

Many RE projects suffer from problems similar to those faced by conventional power plants. Wind and solar thermal projects require huge amounts of land[454]. To establish a 1 MW thermal power plant nearly 5 acres of land is required. If a developer want to establish a utility scale power plant, it requires huge land holdings to be acquired under the strict laws of land acquisition. The land reforms which resulted in the farmers having small parcels of land makes it more complicated to acquire huge land since it has to be acquired from a huge number of persons, causing delays in the execution of the project. In addition to land, solar thermal also requires huge quantities of water. The absence of water in several states having high solar power potential such as Rajasthan may complicate the task of capacity addition[455].

5.7.7 MARKET FAILURES

Market failures can be classified as external benefits or external cost. External benefits lead to decrease in supply because of lower price and external cost lead to higher demand for other energy sources. Market failures can happen due to Lack of investment in research and development as investors not benefiting from efforts[456].

The external cost due to environmental degradation are not reflected in the pricing mechanism of competing fossil fuels. Transmission grids in a given area becomes natural monopolies and reduces the competition in the market affecting the

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[453] Abhishek Jain, S*olar Panel Price in India*, BIJLI BACHAO , https://www.bijlibachao.com/solar/solar-panel-cell-cost-price-list-in-india.html (last visited Dec 6, 2018).

[454] LAND ACQUISITION CHALLENGES, INSIGHT ON CHALLENGES FACED BY EPC CONTRACTORS 34–35.

[455] Davida Wood et al., *10 Questions To Ask About Scaling on-Grid Renewable Energy Frameworks for Designing Good*, WORLD RESOURCES INSTITUTE 1–28 (2014).

[456] S. M. Johnson, *Economics v. equity: do market-based environmental reforms exacerbate environmental injustice*, 56 Wash.& Lee L.Rev. 111, 121 (1999).

opportunity for free market entry and exit. Renewable energy becomes unaffordable due to a high price resulting from high initial investment cost.

The uncertainties in the future electricity prices makes investments in the sector riskier than other investments. The investor expects higher returns for risky Investments. This increases the cost of capital.

Many renewable energy policies and technologies are implemented without much International experience which resulted in a ‘too much too soon’ approach leading to unrealistic expectations and subsequent failures.

5.7.8 LACK OF SUFFICIENT MARKET BASE

The lack of awareness of the end consumers and their unwillingness to opt for renewable energy makes it harder for any producer to create a customer base. There is no natural demand existing for renewable energy. It's all created through push mechanism put in place by various renewable energy policies. Being the cost for initial investments are too high for renewable energy products it may not be a viable option further to create a customer base through marketing campaigns spending more. The nature of the product is such that a proper marketing strategy with sound theoretical background need to be developed for marketing renewable energy.

The lack of such customer base makes renewable energy companies comparatively smaller in size and financial capabilities. This eventually make them not competent to actively participate and contribute in defining of electricity market rules.

In some states it has been made mandatory for the developers to supply the electricity generated only to the state utilities. This distorts the competition in the market and imposes unfair market conditions for the developers [457]. Some state policies have provided exemptions for wheeling to promote open access sale and purchase of electricity. But the benefit is restricted to those who sell

[457] APSERC order dated 20^th June, 2001 in O.P. 1075/2000

the electricity produced with in the state. This discourages the power producers to have access to the consumers outside the state [458].

5.7.9 LACK OF PAYING CAPACITY

Due to the intermittent nature and small scale production renewable energy was mainly targeted to rural areas and poor consumers. The lack of awareness coupled with the high price of renewable energy made it unaffordable to the rural consumers. Both users and the manufactures had very low capital. The unwillingness to pay more main result not only from higher cost but also the physical distance to the place where renewable energy projects are situated, low levels of income less priority given to environmental issues.

State governments due to severe power shortages have mandated independent power producers and captive producers to supply the power produced to the Government owned DISCOMs and the regulatory commissions in those states have also mandated the state requirement as discussed in chapter II. These DISCOMs are running under severe financial stress. The financial stress of DISCOMs results in delay in payments by the utilities to the producers and adversely affects the revenue flow[459].

5.7.10 UNABLE TO MEET ELECTRICITY POWER DEMAND

It is impossible for renewable energy sources to meet the entire electricity demand of the country[460]. The peak electricity demand can be met only with other sources of energy[461]. Integration of large renewable energy generation systems with smart grids will make it more complex since the power supply from various systems vary from time to time.

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[458] FORUM OF REGULATORS REPORT ON OPEN ACCESS, (2017), http://www. forumofregulators. gov.in/Data/WhatsNew/Open_Access.pdf (last visited Dec 9, 2018).

[459] PwC, Renewable energy's transformation of the Indian electricity landscape Message from Mytrah (2015).

[460] NATIONAL INSTITUTION FOR TRANSFORMING INDIA, REPORT ON INDIA'S RENEWABLE ELECTRICITY ROADMAP 2030: TOWARDS ACCELERATED RENEWABLE ELECTRICITY DEPLOYMENT (2016), http://niti.gov.in/writereaddata/ files/document_publication/Report_ on_India%27s_RE_Roadmap_2030-full_report-web.pdf.

[461] B. Mohan, Energy Carriers for Energy Security of India – Investigation for an Optimum Mix (2014) (PhD. thesis, Rajagiri College of Social Sciences).

Solar and the wind are dominating the sustainable energy policies across the globe. Based on various factors like geopolitical bargain of a nation and availability of natural resources, what a country may treat sustainable to them may not be sustainable to other nations. This is because sustainability has been understood to mean only the tradeoff between certain positive and negative factors of a particular energy system. For example, India is having huge energy requirement. It is also under international obligation to minimize the carbon footprint. More than 70% of its electricity production is using gas and coal[462]. We are polluting environment and exhausting the resources, but are attempting to meet the needs of the present generation. Thus it is important to have an internationally acknowledged legal definition for sustainable energy.

Renewable energy is intermittent in nature. Since solar energy depends on the sun light, the climatic conditions will affect the power generation to a large extent. The seasonal differences also cast an important impact in the energy production. The energy production during summer will be greater, but the same level of production cannot be obtained during winter.

Solar power also uses huge area of land. To produce 1MW of solar power, it requires 2 hectares of land. Solar panels thus may actually affect the ecosystem of the area of installation. This makes it difficult to deploy huge solar power plants in population dense states.

5.7.11 SPLIT BENEFIT

The commonly used example to demonstrate the barrier of split benefit is the landlord tenant scenario. Installing solar energy will reduce the energy prices for the tenant where as it will cost for the landlord. The landlord will not install solar panel for the benefit of the tenant. A tenant will not install solar

[462] International Energy Agency, India Energy Outlook - World Energy Outlook Special Report 2015 (2015), http://www.worldenergyoutlook.org/media/weowebsite/2015/IndiaEnergyOutlook_WEO2015.pdf (last visited Jul 22, 2016).

systems as it involves capital investment which he may not be able to realize over the period of time of his stay at the place[463].

While looking at this problem from a best value for the building perspective, an environment friendly building can be branded at a higher value with the benefit of reduced electricity bills for the tenant[464]. Bringing building codes with mandatory installation of solar water heater and solar panels for electricity will be a politically difficult decision but necessary for todays energy requirement and environment protection.

5.8 TECHNOLOGICAL BARRIERS

Technological barriers are those barriers which arise due to various risks involved in adopting the existing technology. The RETs are still in the developing stage the possibility of the existing technologies to get obsolete in the coming years is very high. Other technology related risks and barriers include the absence of minimum standards, inefficient technology etc.

5.8.1 TECHNOLOGY RISK

In case of many new rets such as solar thermal, the risks related to technology are high. Since the technology is at a development stage, the risks remain are not clearly known. Further, even though the technology may have been deployed elsewhere in the work, the expected performance of such technology under Indian conditions not known[465]. Moreover, the risk of technology obsolescence is high. Renewable energy sources involve multiple technologically complicated devices and equipment optimizing for multiple conflicting objectives. Asian Development Bank (ADB) is promoting the development of right energy technology and accelerate their commercialization. ADB consider

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463 Sudhakar Reddy & J. P. Painuly, *Diffusion of renewable energy technologies-barriers and stakeholders' perspectives*, 29 Renew. Energy 1431–1447 (2004), http://linkinghub.elsevier.com/retrieve/pii/S0960148103003975 (last visited Jun 12, 2018).

464 John Kelly et al., Best value in construction 165 (2002).

465 *supra* note 169 Schmid.

that it is very important to identify the right technologies to mitigate the technological risks while funding the gap to promote clean energy[466].

5.8.2 R&D AND MANUFACTURING CAPABILITIES

One of the biggest problems confronting RETs such as solar is the high upfront cost of establishing a solar plant. Investments in R&D with the objective of cost reduction and scaling up of operations to utilize economies of scale have long been advocated as the solutions to these problems. Around the world companies and government backed research projects are engaged in advanced R&D and are continuously setting up bigger, more advanced manufacturing facilities. In India however, manufacturing facilities are only focused on replicating the existing technologies and are limited to small processing units. Currently we have more than 3 GW solar PV cells manufacturing capacity and 9 GW solar modules manufacturing capacity467.

India do not have manufacturing base for Poly-silicon, Ingots/wafers and upstream stages of solar manufacturing. The cost of production is also high in India due to lack of economies of scale and modern technology. This makes the domestic manufactured solar prices uncompetitive with the international sellers. The lending rates in India are also quite high increasing the cost of borrowed capital.

India’s manufacturing capacity is about 700MW for PV modules as compared to facilities in countries like USA, China, Germany, Malaysia etc. Capable of multi-giga watt production. India is relying on international suppliers for equipment as well as technology. However, there is no indigenous capacity/ capability for solar thermal power projects. Explanatory Memorandum issued by CERC for draft terms and conditions for determination of tariff for renewable energy sources, may 2009.

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466 FERENC L. TOTH, ENERGY FOR DEVELOPMENT: RESOURCES, TECHNOLOGIES, ENVIRONMENT 199 (2012).

467 Annexure-I Concept Note on Solar PV Manufacturing Scheme, https://www.indiansma.com/wp-content/uploads/2018/01/MNRE-NMP-GSPD-concept-Dec-2017.pdf (last visited Dec 9, 2018).

5.8.2.1 DS456: India — Certain Measures Relating to Solar Cells and Solar Modules

In DS456: India — Certain Measures Relating to Solar Cells and Solar Modules, the panel and the appellate body rejected India's measures on solar energy procurement under the Jawaharlal Nehru National Solar Mission (JNNSM). A part of the JNNSM the government of India has promised to procure electricity produced from the solar energy producers for a period of 25 years to promote solar energy in India. But one of the conditions of the said procurement undertaking was that the solar energy producers shall use a certain percentage of the modules manufactured by local manufacturers[468].

The United States have challenged this claiming that the measure has violated the principle of national treatment under Article III:4the General Agreement on Tariffs and Trade 1994 and Art. 2 of the TRIMS agreement. According to Art.III:4 GATT, the members shall provide to the goods originating from any other nation treatment no less favorable than that accorded to the like domestic products. Art.2 of the TRIMS also refers to the national treatment principles in investment related measures.

India relied on Art.XX(j) and Art.XX(d) GATT for its defense. India argued that solar cells and modules are the products in general or local short supply as covered under XX(j) GATT. India also argued that XX(d) allows India to have domestic content requirement to secure compliance with the international obligations requiring promotion of sustainable development in energy security.

Both the panel and the appellate body rejected both the arguments and held that the domestic content requirement was in violation of the principles of WTO. They held that none of the documents listed by India are 'law or regulation' satisfying relevant factors or makes a direct obligation on India for energy security and the shortage of supply shall be considered after taking into account supply from all sources including foreign sources.

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[468] DS456: India — Certain Measures Relating to Solar Cells and Solar Modules

5.8.3 NON-AVAILABILITY OF LOCAL TECHNOLOGY

In many cases, the technology or equipment is imported. This implies that spare and replacement parts when required may not necessarily be readily available especially in more remote locations.

Since renewable energy Technologies and investment and renewable energy were not considered as viable business opportunities business houses did not allocate much resources for research and development in Renewable Energy Technology[469].

5.8.4 INEFFICIENT TECHNOLOGY

Inefficient Technology leads to technological risk and may lead to rejection by investors. Renewable energy technologies are in development stage and the lack of Reliability for such Technologies creates lack of confidence in such Technologies in the mind of investors470. The continued resource and development programs in the renewable energy Technology are also important improve the reliability of the technology. In comparison with other energy resources the cost and energy required for renewable energy sources is higher. People perceive it as a sacrifice to opt for renewable energy Technology[471].

5.8.5 NEED FOR BACKUP OR STORAGE DEVICE

Renewable energy are produced intermittently depending on the weather conditions. Solar energy is produced only during the daytime and windmills work only when there is wind with sufficient strength[472]. This makes it to have additional Investments to be made in batteries increasing the cost further. Without storage devices renewable energy cannot be relied for adequate reliable study supply of electricity. Disposal of batteries are also creates

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[469] *supra* note 385 Venkata Ramana, Sinha, and Shukla.

[470] Felix Mormann, *Requirements for a Renewables Revolution*, 38 Ecol. Law Q. 903–966 (2011).

[471] *supra* note 420 Beck and Martinot.

[472] Nathaniel J. Williams et al., *Enabling private sector investment in microgrid-based rural electrification in developing countries: A review*, 52 Renew. Sustain. Energy Rev. 1268–1281 (2015), http://dx.doi.org/10.1016/j.rser.2015.07.153.

environmental issues. Disposal of batteries without environmental impact may also become a huge concern.

5.8.6 LACK OF INFORMATION TECHNOLOGY RESOURCES

Lack of in integration of Information Technology resources into the renewable energy systems limits the experience of Technology transfer. A comprehensive information and communication systems provide better coordination and linkages of renewable energy resources[473]. Free flow of Information and Communication is Paramount for the development of the sector.

5.8.7 LACK OF TRAINED PEOPLE AND TRAINING INSTITUTES

Availability of skilled personals are and other challenge. There are no educational institutions training institutions and training courses because the geographical locations of India which can import education skill and training for the purpose of creating skilled personals[474].

Lack of awareness and apprehensions about the sector mix young candidates to choose careers other than renewable energy. Many people will not opt for renewable energy as a career option ignoring traditional careers [475]. The lack of money circulation within the sector also gets reflected in the salaries of employees in the sector which does not offer a high reward for people to choose renewable energy sector.

5.8.8 LACK OF LOCAL INFRASTRUCTURE

In India there are lots of villages which is still not electrified. This suggest that the basic infrastructure for laying down the lines for transporting electricity to the end consumers has not been achieved in many parts of the country[476]. This lack of infrastructure is reflected in the higher levels of infrastructure

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[473] *supra* note 429 Luthra et al.

[474] *supra* note 432 Union of Concerned Scientists.

[475] INFRASTRUCTURE DEVELOPMENT FINANCE COMPANY LTD., DRAFT: BARRIERS TO DEVELOPMENT OF RENEWABLE ENERGY IN INDIA & PROPOSED RECOMMENDATIONS (2010), http://www.idfc.com/pdf/publications/ Discussion-paper-on-Renewable-Energy. pdf%5CnEnergy Advisory Board 4 12 2012 - Barriers to development of renewable.pdf.

[476] *supra* note 421 Shukla et al.

requirements such as various grids. Since renewable energy installations are located at places far away from grid connectivity, more investments required to create a conducive infrastructure do you work with renewable energy when produced.

5.8.9 LACK OF NATIONAL INFRASTRUCTURE

Lack of national infrastructure like a strong national grid, roads, communication and other Logistics makes it difficult for renewable energy sector as a business to grow[477]. Lack of infrastructure is another major reason for the slow growth of renewable energy sector

5.9 INFORMATION BARRIERS

Lack of awareness and knowledge about the renewable energy technologies, its importance, and the environmental challenges, lack of skilled and educated manpower trained in the particular technology, unavailability of resources data etc pose various barriers and challenges in the solar energy development. These barriers are discussed in detail below.

5.9.1 LACK OF SKILLED MANPOWER

Lack of trained personnel for training, demonstration, maintenance and operations along with inadequate awareness and information programs for technology dissemination impedes renewable energy penetration. Experience indicates that subsequent to installation of RE projects/applications, no proper follow-up or assistance was available for their maintenance thereby impacting their working[478]. The impression that has permeated from such experiences is that RE installations don't work.

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[477] Soma Bhattacharya & Maureen L Cropper, *Options for Energy Efficiency in India and Barriers to Their Adoption: A Scoping Study*, SSRN Electron. J. 3–7 (2010), http://www.ssrn.com/abstract=1590510.

[478] J. Jeslin Drusila Nesamalar, P. Venkatesh & S. Charles Raja, *The drive of renewable energy in Tamilnadu: Status, barriers and future prospect*, 73 Renew. Sustain. Energy Rev. 115–124 (2017), http://linkinghub.elsevier.com/retrieve/pii/S1364032117301326 (last visited Jun 10, 2018).

5.9.2 LACK OF INFORMATION AND AWARENESS

General information and awareness in relation to new technologies and understanding the practical problems in implementing and maintaining RE projects is limited. The lack of awareness among the rural population who forms the customer base for renewable energy sources about renewable energy systems and technologies makes it difficult for the producer to educate and disseminate renewable energy related information[479]. The lack of skilled personnel in maintaining the renewable energy Technologies at the rural areas compel the investors to search for search skilled personnel from other places. The operation and management of Technology driven renewable energy sources become thus more challenging.

5.9.3 LACK OF CONSUMER AWARENESS TO TECHNOLOGY

Societal consensus for the adoption of renewable energy Technologies will be the product of generation of interest in the minds of individuals towards renewable energy[480]. Such interest can be generated only true awareness creation about the cost and benefits of renewable energy.

Society moves towards sustainable ways of energy consumption only when they appreciate the bad effects of climate change and environmental degradation and alternate renewable energy sources are available to them at cheaper rates[481]. Average consumer still consider energy being a product to be supplied to them by the government or government authorized agencies. Lack of awareness that it can be produced at home with the help of solar panels to meet domestic requirements may hinder the growth of this sector. Lack of awareness regarding the market where the hardware for solar installations are sold to the consumers hold them back from trying for such experiments.

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[479] *supra* note 421 Shukla et al.

[480] *supra* note 460 Reddy and Painuly.

[481] D. G. Ockwell et al., *Key policy considerations for facilitating low carbon technology transfer to developing countries*, Energy Policy (2008).

5.9.4 UNAVAILABILITY OF SOLAR RADIATION DATA

The Government of India has published are solar radiation data which is accessible online. This data is not sufficient to clearly calculate the radiation which may be available at the site where solar installation is planned[482]. Solar energy incident depends on Earth Sun movement, atmospheric attenuation Earth tilt on the axis etc. The production of electricity at the site of installation of solar panels depends on a number of factors which effects the radiation. A data which is prepared without taking into consideration switch minute details is a not reliable data for installation. India lacks a database of radiation prepared with data inputs at the micro level.

5.9.5 LACK OF EXPERIENCE

Customers of reluctant to undertake renewable energy as a source of energy for their names because of lack of experience with a new source of energy[483]. The lack of reliable information and apprehension towards adapting new energy sources Hinder the growth of the sector. Most of the rooftop developers have no primary information other than from the vendors and other sales personnel about the benefits of the installation of the power plant. This makes it difficult for them to form an informed opinion. Also the prices of the solar modules vary depending on the quality and other features. A normal residential roof plant, the owner will be completely unaware of the price differences of the solar modules and other equipment and the contractor tend to cheat the roof top owner with cheap installation at a higher cost and resulting in eventual losses for the investor.

5.10 SOCIO CULTURAL BARRIERS

Businesses succeed and fail depending on the attitude of the society as well. A society which is not willing to adopt new technology or disregards the

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[482] Francesco Nicolli & Francesco Vona, *Heterogeneous policies, heterogeneous technologies: The case of renewable energy*, Energy Econ. (2016), http://www.mendeley.com/research/heterogeneous-policies-heterogeneous-technologies-case-renewable-energy.

[483] Souvik Sen & Sourav Ganguly, *Opportunities, barriers and issues with renewable energy development – A discussion*, 69 Renew. Sustain. Energy Rev. 1170–1181 (2017), http://linkinghub.elsevier.com/retrieve/pii/S1364032116306487 (last visited Jun 9, 2018).

environmental concerns cannot be the right ground for renewable energy technologies to grow.

5.10.1 SOCIAL ACCEPTANCE

Solar being a renewable energy source has a higher land footprint. Land is valued as one of the precious assets by local communities. They demand higher compensation for giving away the land for renewable energy projects even if they are the beneficiaries of the project.

The social acceptance of rooftop solar panels is gradually improving even though many have still not appreciated the emerging need of it. An improved communication exchanges within the society regarding solar and renewable energy sources may improve the situation[484].

5.10.2 REHABILITATION ISSUES

Rehabilitation is a major issue in the case of hydropower projects. As far as wind and Solar are concerned rehabilitation need not be a major constraint for the development of the sector[485].Though the solar parks requires huge parcels of land, usually the government and developers procure barren land or agricultural field for setting up the new plant. The JNNSM guidelines suggest that the rehabilitation of the project affected people shall ensure either an improvement in the living conditions or at least regain the previous standards after displacement for the project[486]. The ministry has prepared a detailed rehabilitation and resettlement policy in line with the National Rehabilitation and Resettlement Policy, 2007.

5.10.3 FAITH AND BELIEF

The general nature of human being is to demonstrate resistance to change. The resistance increases with lack of understanding and awareness about new

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[484] *supra* note 429 Luthra et al.

[485] *supra* note 54 Renner, Sweeney, and Kubit.

[486] Ministry of New and Renewable Energy, JAWAHARLAL NEHRU NATIONAL SOLAR MISSION GUIDELINES FOR DEVELOPMENT OF SOLAR PARKS (2016), https://mnre.gov.in/file-manager/UserFiles/Solar-Park-Guidelines.pdf (last visited Dec 9, 2018).

technology and development. Renewable energy Technology may have n number of benefits but all switch benefits cannot be communicated to the consumers because of lack of receptivity due to resistance to change and lack of understanding of new technological development.

Minute and detailed quality data regarding irradiation may not be available and such lack of reliable irradiation data makes it difficult to calculate the energy output as well as the return on investment. Lack of skilled human resources to operate and maintain renewable energy assets is another major barrier for investments in the sector.

People consider renewable energy as an alternate energy source. Creation of public and institutional awareness regarding the sustainable transition from fossil fuels to environment friendly renewable Technologies is required[487]. People have faith in the traditional time tested energy resources but, investors and consumers alike are skeptical about a new technology or source of energy made available to them.

5.10.4 CONSUMER BEHAVIOR BARRIERS

Consumer perceptions of the usefulness of solar systems compared to conventional Technologies and the quality of Renewable Energy Technologies are causing Barrier for deployment of renewable energy Technologies488. People have inhibitions about the working of the solar panels and they consider it as a costly alternative to the conventional source of energy was revealed in a study conducted among the people in the state of Andhra Pradesh[489]. Another study reveals that about 55% of the people who have responded to the survey conducted have still not used any renewable energy application[490].

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487 *supra* note 480 Sen and Ganguly.

488 *Id.*

489 AN OVERVIEW OF PUBLIC PERCEPTION ABOUT THE SUITABILITY OF SOLAR POWER PANELS AS AN ALTERNATIVE ENERGY SOURCE IN ANDHRA PRADESH, www.aptransco.gov.in.This (last visited Dec 10, 2018).

490 People's Perception Study, http://awsassets.wwfindia.org/ downloads/peoples_ perception_ study__renewable_energy_in_india_2014.pdf (last visited Dec 10, 2018).

5.11 ECOLOGICAL AND GEOGRAPHICAL BARRIERS

Ecological and geographical barriers include the scarcity of resources, geographic conditions and the impact of the power plants on the ecology and related issues.

5.11.1 SCARCITY OF NATURAL AND RENEWABLE RESOURCES

The huge population makes it important Porcupine huge land area 4 various home and business Constructions hospitals and schools entertainment facilities etc. Providing food security to search was population is another major challenge. Huge area of land need to be cultivated to meet the food requirements of the country[491]. Renewable energy depend on natural resources such as wind, solar radiation etc. The human Occupancy of what areas of land and other resources makes it impossible for renewable energy developer to choose locations with optimal renewable resource availability.

Solar irradiation resources vary according to the location. Thus the same equipment may deliver different levels of power output depending on the location and irradiation. The climatic conditions are also an important factor as the number of days of sunlight greatly vary from location to location[492].

5.11.2 GEOGRAPHIC CONDITIONS

Solar and wind energy are intermittent depending upon the weather conditions. The geographical locations are important in such cases. Some part of the country receive more hours of Daylight while others receive less[493]. The number of hours of solar radiation is a factor which determines the efficiency of solar panels. Investors will be reluctant to invest in Renewable Energy Technology like solar if the preferred geographical conditions does not exist.

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491 *supra* note 460 Reddy and Painuly.

492 Literature Review of Market Barriers to Solar Technologies, http://www.durban.gov.za/City_Services/energyoffice/Documents/Market Barriers to Solar Technologies v1.pdf (last visited Dec 10, 2018).

493 Williams et al., *supra* note 469.

Though sun rays reach everywhere, but the number of days of bright light available in a year is a determinant factor while deciding on investing in a particular location. The number of days of sun light availability varies from state to state. Some states are for that reason are considered to be solar rich states. The states like Tamil Nadu, Gujrat and Madhya Pradesh are blessed with rich resources of wind energy.[494]

5.11.3 ECOLOGICAL ISSUES

Renewable energy sources also have ecological impacts which has adverse impact on surrounding ecology. The noise created by wind mills, land required for renewable energy such as solar installations where ecology is affected with loss of habitat for human and other living creatures[495]. Our Ecological footprint, the book published in 1996 opened the door of new researches in area based sustainability studies which has brought into light various ecological challenges of development through research[496].

5.12 CONCLUSION

The current legal Framework in India is scattered without uniformity having no currents and lacks stability. The Framework has failed to gain the confidence of investors due to abrupt policy changes causing losses for the investors. The national energy lotion also be developed by assessing and evaluating through the prism of energy trilemma. Global Institutional and policy framework addressing all the aspects of energy is required for the development of the energy sector.

The general investment environment in India is improving as evidenced by the ease of doing business ranking. But there are many areas of concern which makes it difficult for doing business in India. In order to improve Investments

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[494] Mayank Aggarwal, *Wind , solar will be cheapest power source in G20 countries by 2030 , says Greenpeace study* LIVEMINT (Jul. 8th 2017).

[495] *supra* note 393 Ockwell et al.

[496] N. Chambers, C Simmons & M Wackernagel, Sharing nature’s interest: ecological footprints as an indicator of sustainability (2014), https://content.taylorfrancis.com/books/download?dac=C2011-0-08011-1&isbn=9781317972174&format=googlePreviewPdf (last visited Dec 10, 2018).

in solar energy sector specifically and renewable energy generally, the ease of doing business has to be improved. Even though various Central Government Ministries and many state governments have taken measures to improve the scenario, the renewable energy rich States lag behind in the index.

While the state governments have adopted policy measures to improve the renewable energy generation and capacity addition in the respective states, only few states which are bestowed with the abundance of resources in Renewable Energy has clear policies and plans to generate more electricity than their renewable purchase obligation.

There are lot of variations in the policy measures adopted by various states. There is no uniformity across the country. An investor who wish to invest in different states may find that his experience in one state need not help him in another.

The state policies focus on meeting local energy demand and supply which doesn’t promote the national interest. It is thus necessary to have a comprehensive mechanism comprising of law, policies, infrastructure and governmental machinery to create a conducive environment for attracting private investments in the sector to meet National ambitions. We need new investment models and new commercial instruments to deal with renewable energy sector Investments.

CHAPTER 6

THE STRUCTURAL ANALYSIS OF THE RENEWABLE ELECTRICITY SECTOR AND INVESTMENT DECISION

6.1 INTRODUCTION

The investment decision situation is broken into its elements using a framework developed with inspiration from the Institutional Analysis and Development framework[497]. The elements are identified and the key actors, the investors are approached for a survey through questionnaire. The survey has helped to identify the main detractors and the main promoting measures for renewable energy.

The method of study is inspired from various frameworks suggested by various authors including the Institutional Analysis and Development framework developed by Nobel Laureate late Dr. Elinor Ostrom. According to the framework used in the study, the action situation is deconstructed into various elements influencing the decision making. Here the investment decision by a developer is considered for the study.

6.2 INVESTMENT DECISION SITUATION

The framework is used to identify all the factors which are having an impact on the investment decision and to understand those factors which can be modified through formal law. The factors which affects the decision can be broadly classified as those which can be changed by rules and those which cannot be changed by rules. The researcher propose to identify the intensity and impact of a factor on the decision making process and propose changes through formal rules.

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[497] Elinor Ostrom, *Response: The institutional analysis and development framework and the commons*, 95 Cornell Law Rev. 807–815 (2010), http://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=3170&context=clr.

6.2.1 BIOPHYSICAL ENVIRONMENT

The below map shows the geographical opportunities and limitations for solar energy production[498].

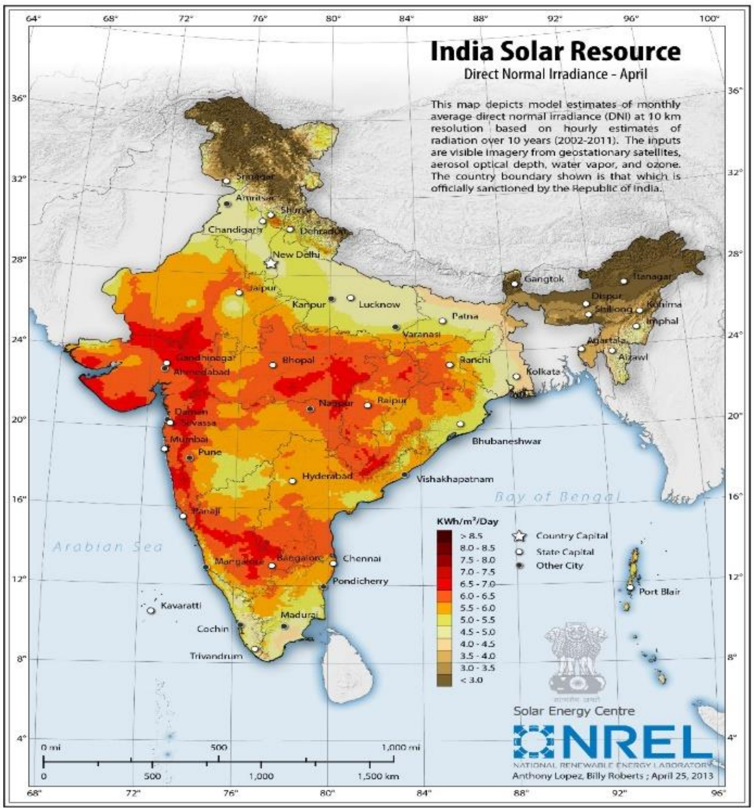

Fig. 6.1 Solar Irradiation Map

The National Institute of Solar Energy has an estimated solar potential of 749 gigawatts. It is spread over a wide range of states, viz. Rajasthan (142 GW), Jammu and Kashmir (111 GW), Maharashtra (64 GW), Madhya Pradesh (61 GW), Andhra Pradesh (38 GW), Gujarat (35 GW).

6.2.2 SOCIOECONOMIC CONDITIONS

It is necessary to add significant new generation capacity to meet social and economic needs, enabling India to combine renewable energy with renewable energy compared to other regions. Power utilities and retail customers alike

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[498] *supra* note 318 N.R.E.L.

have large-scale renewable energy suppliers that meet their basic energy needs. India's per capita energy consumption is very low, in fact it is less than one third of the world average and lower than other comparable developing countries. Recent growth in the last decade (2005-2015) increased from 612 kWh to 1,010 kWh - an increase of 5.1% per annum.

6.2.3 POLICY SUPPORT

Energy security is a major policy concern. Primary fuels are India’s single largest importer, accounting for 37-40% of total imports (2013-2015) and the period of high commodity prices led to restricted supplies, budget deficits and ash fuel. Coal is responsible for 76% of the electricity generated. The government's drive to create 175 GW of renewable energy by 2022 will help improve energy security and improve the energy mix. The policy recommends using RPO and RGO targets to develop this, and regulators see measures to improve enforcement.

The government has established a strong procurement model in the form of auctions and standard bidding documents (RFQ, RFP and PPA) to facilitate a quick, harmonious and transparent bidding process for solar development.

Rural electrification and 24X7 power distribution is a top priority of the government. Based on the available statistics, 19,706 villages have no access (2015), and a large number of households (33%) have no electricity connection (Census 2010).

In most states, rural electricity supply is intermittent and poor quality. New generation capacity must be built, and the affordable costs and concerns of nominal customers are the best, and the cost of renewable energy is the best. Urban centers have also grown rapidly, moving in the direction of China (50% of the urban population) and Brazil (87%) of relatively non-urbanized India, with only 31% of the city's population. Urban areas are more energy-intensive and are a key component of demand growth.

6.2.4 PUBLIC INTEREST AND LOCAL DEVELOPMENT

Public opinion supports sustainable energy in India, which has helped the states maintain a positive and stable policy environment for many years. In a similar vein, many private companies are setting up renewable energy projects for their own use, or commit to 100% of their consumption from green sources. State-owned organizations have been tasked with setting up 10 gigawatts of solar power projects.

The courts have also taken a positive stand. Recently (May 2015), the Supreme Court ruled that renewable liabilities are of great public interest and can be imposed on hostage users and open access customers. Renewable energy projects are often located in remote, remote areas and, in some cases, arid areas. Improving the social and economic prospects of the workforce even in limited numbers. Decentralized energy ventures such as the roof-top solar power plant and solar-powered agricultural pump sets offer the potential to generate electricity at the tail end of the grid, and net-metering policies offer a moderate source of income.

6.2.5 ECONOMICS AND PROFITABILITY

As described earlier, renewable energy generation competes with electricity from mainstream fossil fuels such as coal and natural gas. It is driven by a variety of global factors (e.g. technology, module prices, optimization) and regional factors (competition in capital goods and EPC, financial engineering, new entrants and captive users).

Competition is a powerful force. There are over 20 wind turbine manufacturers in India with an annual output of 11 gigawatts. Most of them (Suzlon, WindWorld, Inox Wind, Region PowerTech, GameSa) offer a complete turnkey solution, while others (GE and Vestus) focus on products.

The supply of solar modules mainly comes from imports, while the balance of plant and inverters is available locally. The solar EPC market is also highly competitive as it offers competitive pricing and turnkey solutions for developers.

State electricity regulators maintain a 14-16% after-tax income in determining the tariffs for relevant renewable energy technologies such as wind, biomass, waste-to-energy or small hydro. Where auctions like Solar Power are held, project developers make decisions based on return expectations and generally win bids of up to ` 2-3.

6.2.5.1 Institutional Arrangements

The Electricity Act 2003 and various institutional arrangements created under the Act are discussed in detail in chapter-II. Institutional arrangements and state government policy factors affecting the decision making are further detailed under chapter III.

6.2.6 ACTION ARENA AND THE ACTORS

The Action Arena can be described through the pictorial representation as given below.

Fig. 6.2 Actors in the Action Arena

Central Government is the major player with important roles being played at the apex level of the whole regulatory and policy mechanism and thus have a major control over the investment situation. State Governments regulate the sector on the ground. It is also the consumer for energy produced. State government utilities enter into power purchase agreements and the profitability of the investment or attractiveness is deeply dependent on the state governments approach to the problem. Getting finance is the other major challenge and the financial institutions are the other major player in the action arena. EPC Contractors play a greater role at the center of this situation. They are the actors who get the investors convince to invest in the solar energy. They introduce the other three actors to the consumer in most of the cases and get the installations done for the investor/consumer.

6.2.6.1 Action Situation

At the action situation is the investor/consumer who evaluates various factors and makes an investment decision. Various factors that can positively and negatively influence the investment decision are identified and the same is put forth before the respondents to evaluate on a scale of 1 to 5.

6.2.7 STATE WISE DISTRIBUTION OF RESPONDENTS

According to the solar radiation data provided above, not every states are blessed with the geographical conditions to produce solar energy. The survey primarily focuses on those factors which influence the investment decision by a developer. The framework is used to identify all the factors which are having an impact on the investment decision and to understand those factors which can be modified through formal law.

The respondents are EPC contractors selected from the Solar Mango EPC directory. An Email was sent to all the EPC contractors across the country to fill up the survey. Some of the contractors were surveyed by speaking to the over the phone.

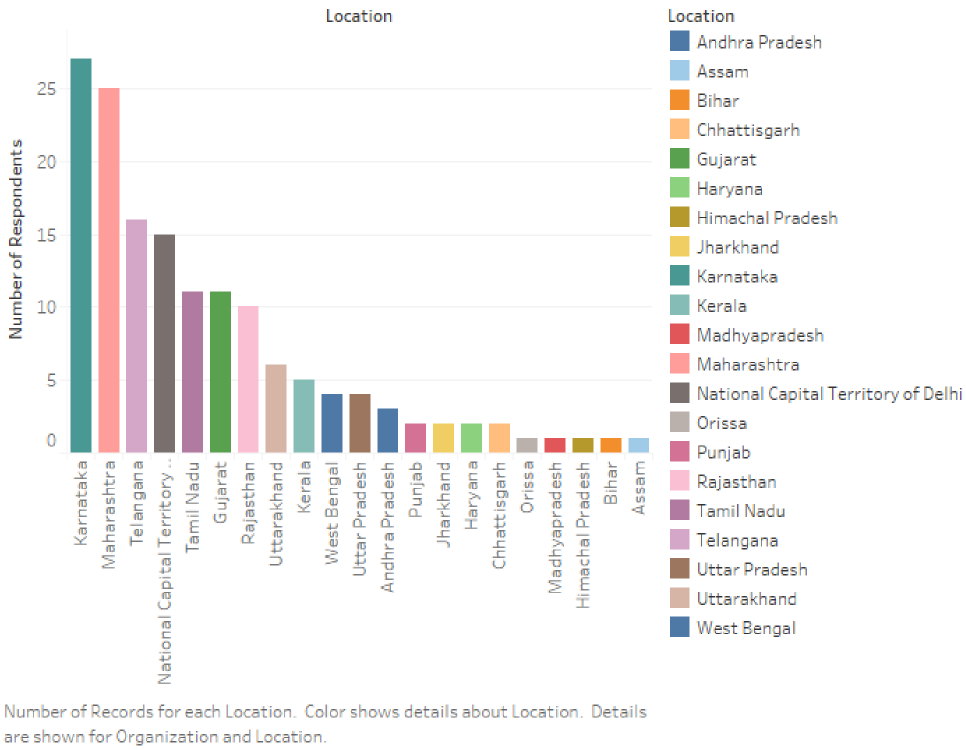

Fig. 6.3 State wise distribution of respondents

The respondents are primarily spread across twenty one states. The maximum number of respondents are from Karnataka. The states with better number of respondents are also the states having better policy measures and the total installed capacity in those states are also comparatively higher, except Maharashtra. There are a total number of 150 respondents participated in the survey. The respondents fairly represent the universe and has provided credible information on various questions asked.

The following table shows the number of respondents from each state and the total number of the respondents.

Table 7.1 Total number of respondents

Statewise count of respondents

Location	
Andhra Pradesh	3
Assam	1
Bihar	1
Chhattisgarh	2
Gujarat	11
Haryana	2
Himachal Pradesh	1
Jharkhand	2
Karnataka	27
Kerala	5
Madhyapradesh	1
Maharashtra	25
National Capital Territory of Delhi	15
Orissa	1
Punjab	2
Rajasthan	10
Tamil Nadu	11
Telangana	16
Uttar Pradesh	4
Uttarakhand	6
West Bengal	4
Grand Total	150

Sum of Number of Records broken down by Location.

There are twenty seven respondents from Karnataka followed by twenty five from Maharashtra. There are good number of residential customers opting for standalone roof top solar in Maharashtra which has not reflected in the installed capacity statistics.

The total number of respondents are 150. The questionnaire is given in APPENDIX. Since the number of respondents are spread across various states the survey data fairly represents the trend in the country. The more number of participants from some of the states will balance the national trend with the exposure of those respondents to the better policy and business environments of their respective states.

6.2.7.1 Evaluative Criteria

The evaluation criteria is classified as positively and negatively influencing factor at a scale of influence of 1 to 5. The details of the evaluation criteria is detailed below.

6.3 THE FACTORS THAT INFLUENCE THE INVESTMENT DECISION

The survey was conducted to understand the elements of the investment decision making process. Investment decision is arrived at after considering various factors. There are key drivers and detractors in the investment decision. Various promoters and detractors of the investment decision identified through survey of numerous literatures on the subject have been listed and asked the respondents to score on a scale of 5 about the nature of influence each item cause on the investment decision.

6.4 FACTORS POSITIVELY INFLUENCING THE INVESTMENT DECISION

There are many factors that influence an investment decision. The factors that are positively influencing an investment decision in solar energy are listed below. The percentage scores in the level of influence is also given below.

The responses have been recorded on Likert Scale of 1 to 5 on the degree of influence each factor has on the investment decision. The responses with Extremely Influential has a score of 5, Very Influential has 4, Moderately Influential has 3, Slightly influential has 2 and the least score is marked for the category of responses with Not at all influential. The scores are used to calculate the mean scores and standard deviations to ensure the reliability of the data.

6.4.1 REDUCED ELECTRICITY BILLS

Reduced electricity bills is one of the major factor for industrial and residential investors to opt of solar energy. Most of the rooftop solar installations are induced by the fact that the energy produced from the solar reduces the dependability on the DISCOMs for energy[499]. The results of the survey are presented below.

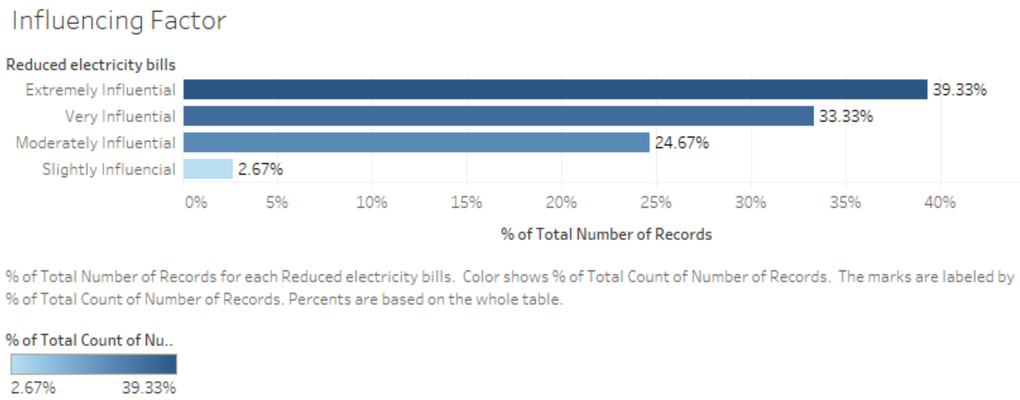

Fig. 6.4 Reduced Electricity Bills

The reduced panel costs has made it easier for the investors to recover the investment in a short period. The respondents were asked that how far the fact that the solar installations will reduce electricity bills of the consumers is an influencing factor for them to opt for solar.

Nearly 40% of the respondents have suggested that the reduced electricity bills is extremely influential in making the investment decision. All the respondents have suggested that the reduced electricity bills is an influencer. None of the respondents have marked this as not an influencing factor. The average of the

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[499] F.E., *No more hefty electricity bills! You might have to pay almost nothing for power if this solar model works*, FINANCIAL EXPRESS (July 4th, 2018) https://www.financialexpress.com/economy/no-more-hefty-electricity-bills-you-might-have-to-pay-almost-nothing-for-power-if-this-solar-model-works/1231003/.

total response score is 4.09 and median 4. The response data shows a standard deviation of 0.86. A total of 146 respondents constituting 97.33 percent of the samples have suggested this as an influencer while 2.67% considers that this has only very limited influence on the investment decision. 39.33 percent suggested it as extremely influencing while 33.33 percent are of the opinion that this is very influential. 24.67% suggest this as moderately influential.

6.4.2 SUBSIDIES

There are many government schemes to promote renewable energy. Capital subsidy is one of the age old government mechanism to promote a particular policy[500]. Subsidy as a policy measure is suggested to be an unsustainable model for long term.

From the perspective of the beneficiaries of subsidy, it is an important measure for them to opt for the renewable energy solutions since the initial capital cost is not attractive to make investments in the sector.

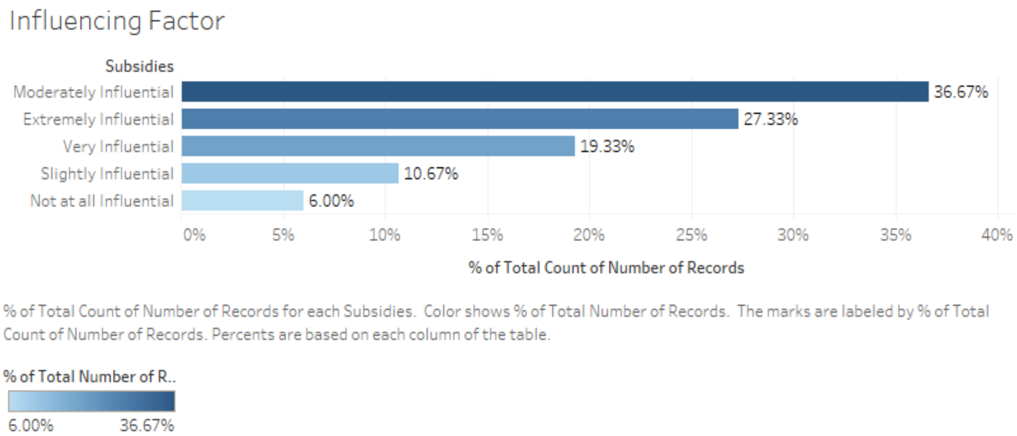

Fig. 6.5 Subsidies

Majority of the respondents consider that subsidies are an influential factor in the investments. More than 36% of the respondents believe it is moderately influential while 27.33 percent have suggested that this is an extremely

[500] Joseph A Cullen & Stanley S Reynolds, MARKET DYNAMICS AND INVESTMENT IN THE ELECTRICITY SECTOR (2017), http://www.lancaster.ac.uk/staff/desilvad/LR_v1. pdf (last visited Aug 28, 2018).

influential factor. Out of the total number of respondents 9 are of the opinion that subsidies are not at all an influential factor.

6.4.3 TAX BENEFITS

Tax benefits are a motivating factor mainly for business and commercial establishments[501]. The government had offered 80% accelerated depreciation under section 32 of the Income Tax Act 1961, till 2016-17 and has now scaled down to 40% from the financial year 2017-18. To majority of the commercial establishments this is a saving on their tax liability. To illustrate, if an entity invests 1 crore rupees in solar 40 lakh will be returned to him in the first year itself as accelerated depreciation reducing the total income tax burden.

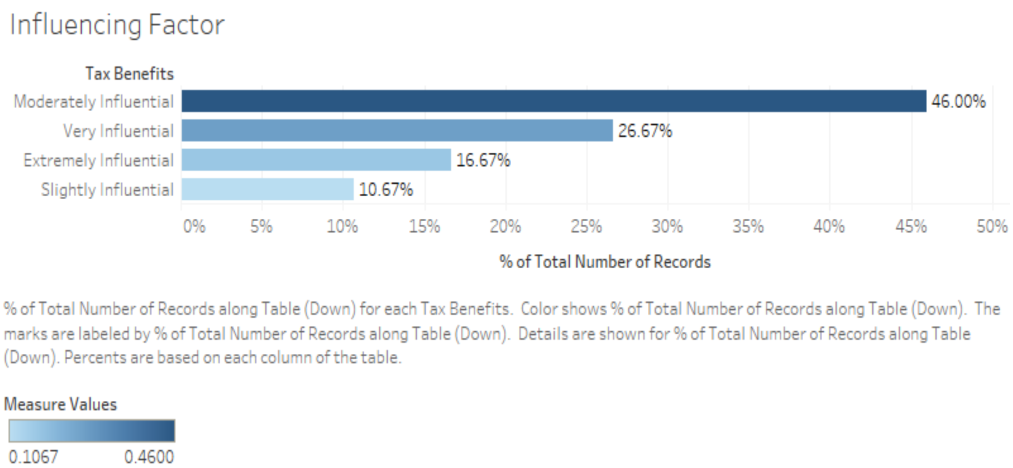

Fig. 6.6 Tax benefits

All the respondents have suggested that tax benefits are a reason for investments in solar. Though the highest number of respondents constituting 46% has the opinion that its influence is only moderate, another 26.67% and 16.67% of the total number of respondents consider tax benefits are very influential and extremely influential respectively.

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[501] *supra* note 388 Timilsina, Kurdgelashvili, and Narbel.

6.4.4 APPRECIATION IN THE VALUE OF THE BUILDING

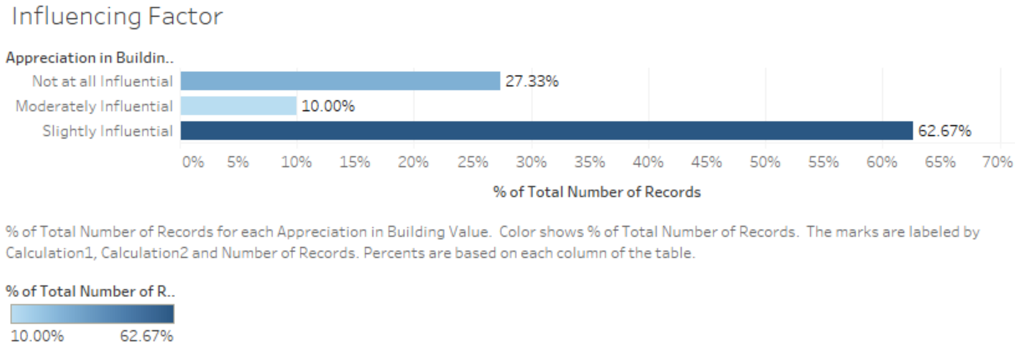

Fig. 6.7 Appreciation in the Building Value

Many of the investors do not think that there will be any appreciation in the value of the building if a solar installation is made. For this reason they have suggested that the idea of an appreciation in the value of the building is not a major factor for influencing the investment decision. 27.33% of the samples have responded to this question by suggesting that this factor is not at all an influencing factor. The remaining 72.67%is of the opinion that this factor may be of very little influence ranging from slightly influencing to moderately influencing.

6.4.5 ADVANTAGE OF NO ADDITIONAL SPACE REQUIREMENT FOR ROOFTOP SOLAR

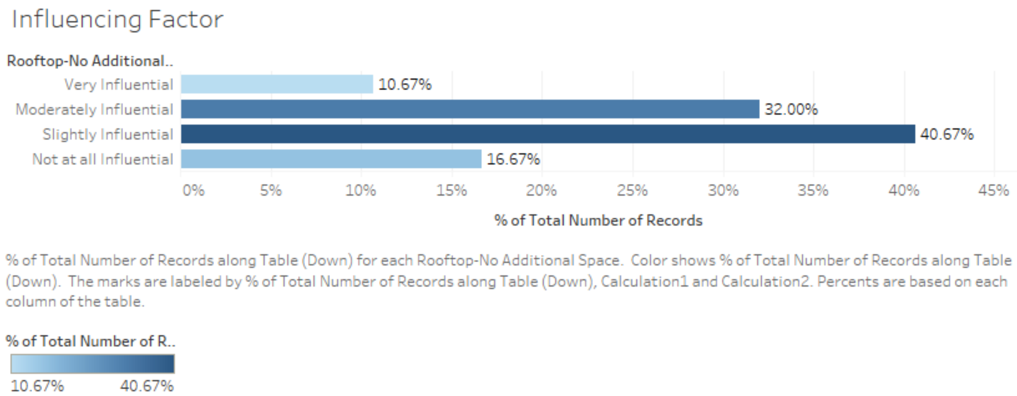

Fig. 6.8 No additional Space Required

The land requirement for solar installations are huge. Utility scale power projects use barren or agricultural land for installation. Usually such projects will have to bear the cost of the land. The commercial investors also may be using their precious land to install solar. In this context a rooftop solar project is always an attraction for commercial and residential investors who can avoid the cost of land and can also save on the space requirements.

The respondents are vary of the scope of influence of this factor. 40.67% are of the opinion that this is slightly influential which is on the scale of 1 to 5 of the levels of influence stands second from the bottom, just above those who have opined that this is not at all influential. 10.67% considered this as a very influential factor while to 32% of the respondents this is a moderately influential factor.

6.4.6 REDUCED CARBON FOOTPRINT AS AN INFLUENCING FACTOR

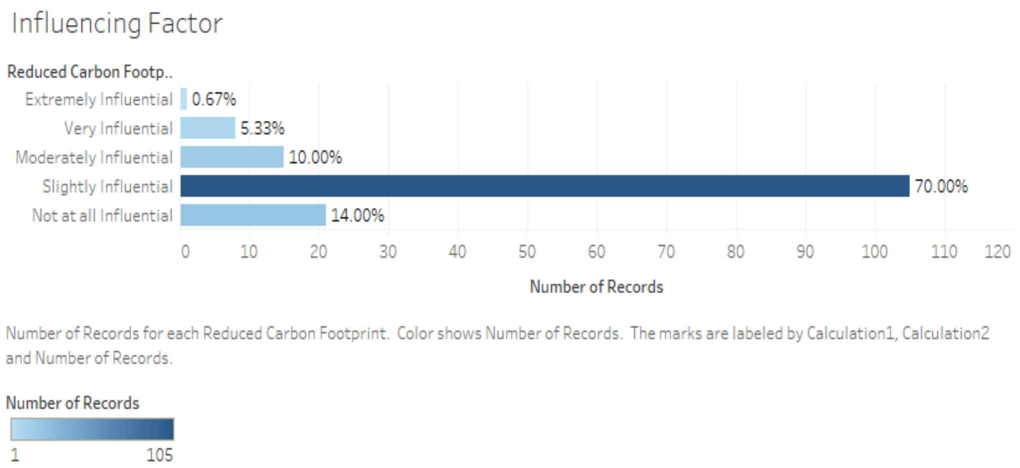

Fig. 6.9 Reduced Carbon Footprint

We are not yet environmentally sensitive to the levels it is required now. 70% of the respondents have felt that this factor has only a slight impact on the investment decision, while 14% believe that this is not at all an influencing factor.

6.4.7 GOVERNMENT COMPULSION AS AN INFLUENCING FACTOR

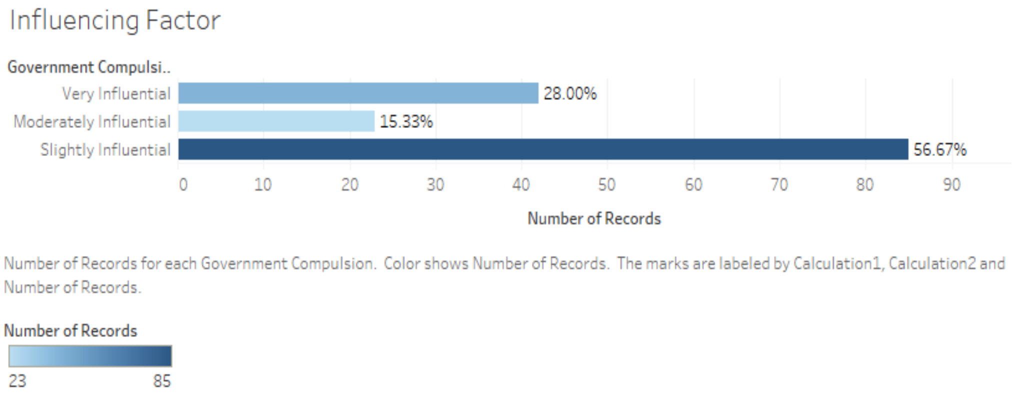

Fig. 6.10 Government Compulsion

Government of India has made it compulsory for large power distributers and consumers to purchase 17% of its total energy consumption from renewable energy sources. The obligated entities are now procuring 6.75% of solar and 10.25% of other sources of renewable energy. The government has also proposed to increase the RPO to 21% by 2022 with 10.5% on solar and 10.5% on other sources. These obligations makes the entities to either purchase the renewables from producers and developers or to install themselves.

The government compulsion is not on the small producers and residential investors. But the obligation of other entities will drive them to procure more renewable energy creating a demand for the same in the industry.

28% of the respondents have considered the government obligation as a very influential factor while 56.67% consider this as slightly influential. 15.33% of the total respondents have thought of this factor having a moderate influence on the investment decision.

6.4.8 SUITABILITY FOR ALL WEATHER CLIMATE

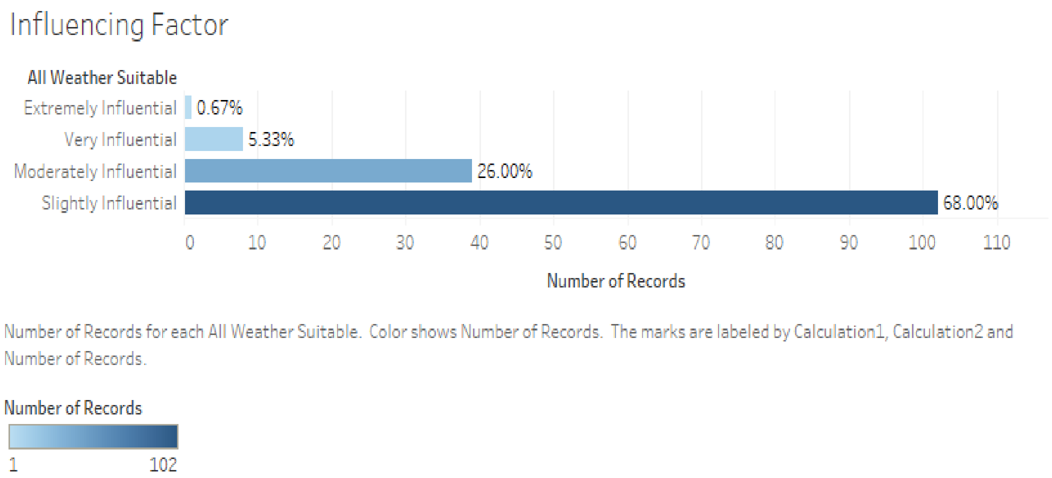

Fig. 6.11 All Weather Suitable

During the turbulent days of Kerala floods, while all electric supply and communication were affected, the home of a man who has installed solar panels at his home has become a relief center. The neighboring community and the relief team charged their mobile phones at his home and has helped in connecting with the world effectively.

Solar energy is suitable for all weather climate.in harsh winters and rainy season the productivity may be reduced but is still a reliable source of energy during the turbulent times like the floods.

A very few respondents consider this is an extremely influential factor. 68% of the respondents consider this as slightly influential. While 26% consider this as moderately influential.

6.4.9 ENERGY OF THE FUTURE

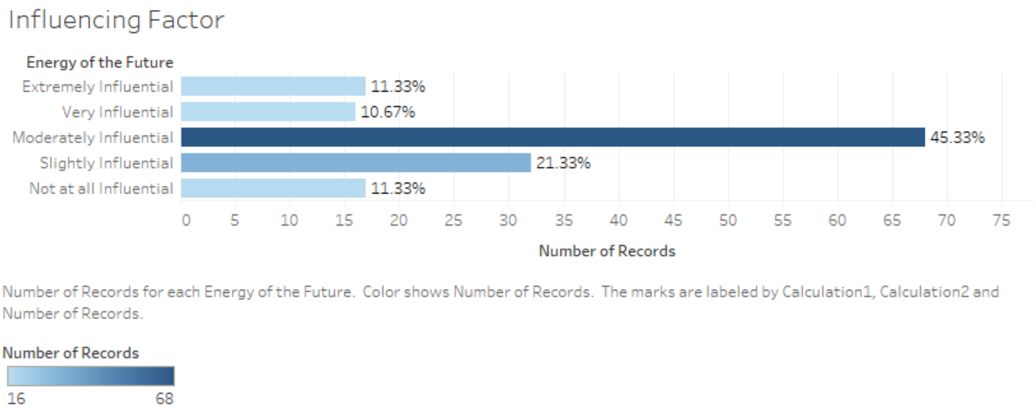

Fig. 6.12 Energy of the Future

The number of people who consider solar as the energy of the future is just 22% which is the combined total of those who have responded with extremely influential and very influential options. 45.33% of the samples consider this as a moderately influential factor while making an energy investment decision.

6.4.10 LOW MAINTENANCE COST AS AN INFLUENCING FACTOR

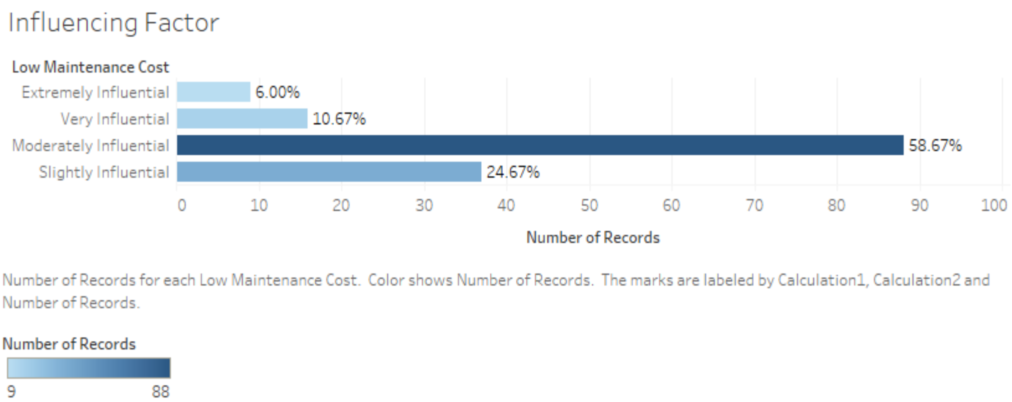

Fig. 6.13 Low Maintenance Cost

Low maintenance cost makes renewable solar energy installations an attractive investment for investors. 58% of the respondents suggest that it is moderately influencing factor, while 10.67% and 6.00% of the respondents consider it as very influential and extremely influential, respectively.

6.4.11 PROFIT

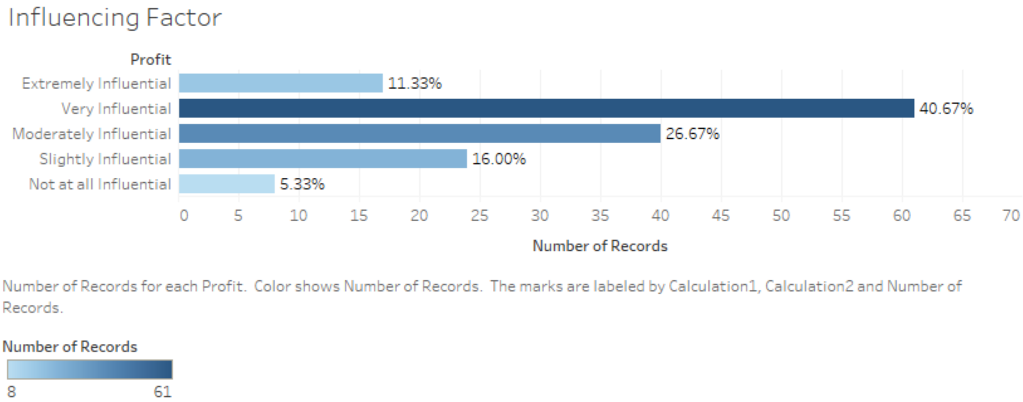

Fig. 6.14 Profit

The net metering method introduced by various state DISCOMs have proven to be a success providing a net benefit to solar investors.

From the responses of the survey conducted it can be understood that 40.67% of the respondents consider that profit motive is one of the important drivers for the solar investments. 11.33% believe this as extremely influential. For the residential investors making profit need not be an investment driver. Thus a minority of the respondents constituting 5.33% believe that this is not at all influential.

6.4.12 EXPERIMENTAL INVESTMENT

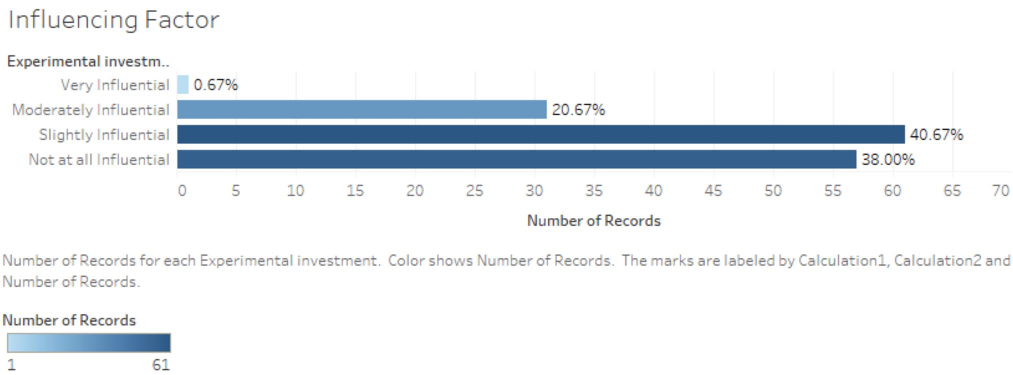

Fig. 6.15 Experimental Investment

For some investors, any new investment opportunity is an experiment. Since renewable energy investment has not witnessed how exactly the industry will behave once it is matured, makes it a risky investment. The hype created around the renewable energy technologies as future energy and the government push for renewables have made many to think in the direction of making investments in the sector as an experiment. But the survey suggests that this is not a driving force in the Indian conditions. 38% of the respondents feel this as not at all an influencer while 40.67% consider this can be slightly influencing the investment decision. Since such a majority of respondents suggest this to be of not making an impact in the investment decision, this is not a major influencer.

6.4.13 BRAND VALUE AS AN INFLUENCING FACTOR

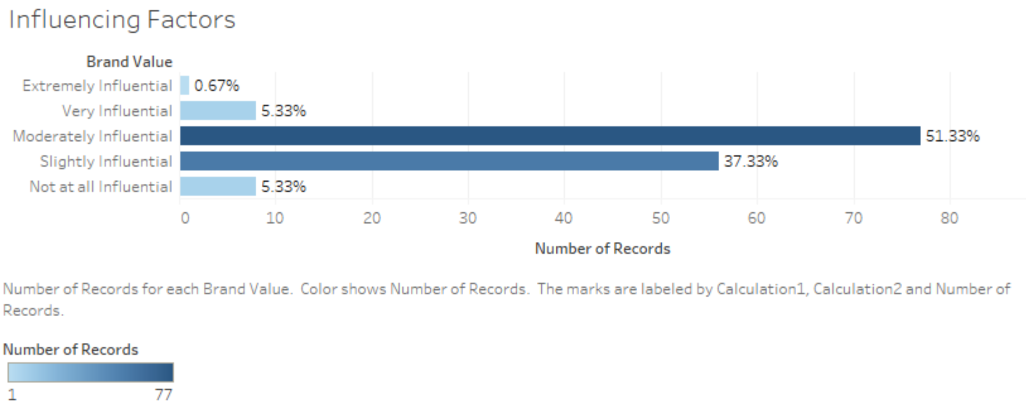

Fig. 6.16 Brand Value

Going green is the global branding mantra today. Companies are making a social impact and image as pro-environment and invests in the global climate change endeavors. This question aimed at understanding the level of influence a green branding has on the investment decision. It can be seen that this is not a major influencer with 51.33% considering this as only moderately influential while 37.33% suggested it is even less, at slightly influential level. 5.33% considered this as not at all influential who majorly represented the residential investors.

6.4.14 INVESTORS WANT TO MOVE WITH THE TREND

Investors moving with the trends in investments is common feature all around the world. Whether the investments in renewable energy has become a trend is still can’t be positively answered, but whether any such trend is being influencing the Indian investors is worthless to ask in the light of any perceivable trend in investment. The results suggests that there exists no such investment trend in renewable energy. Investors do not invest in this as an investment trend. 40% suggests there can be a moderately influence where as 48.67% say it is slightly influential.

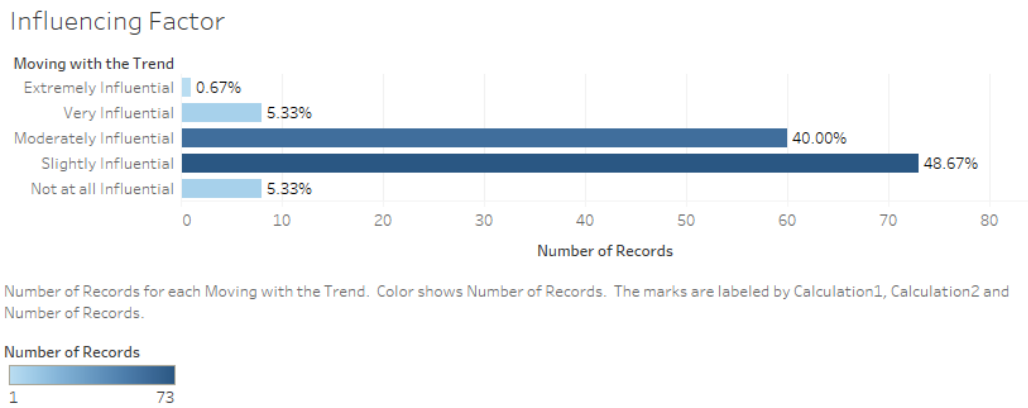

Fig. 6.17 Moving With the Trend

6.4.15 SOCIO ENVIRONMENTAL CONSIDERATIONS

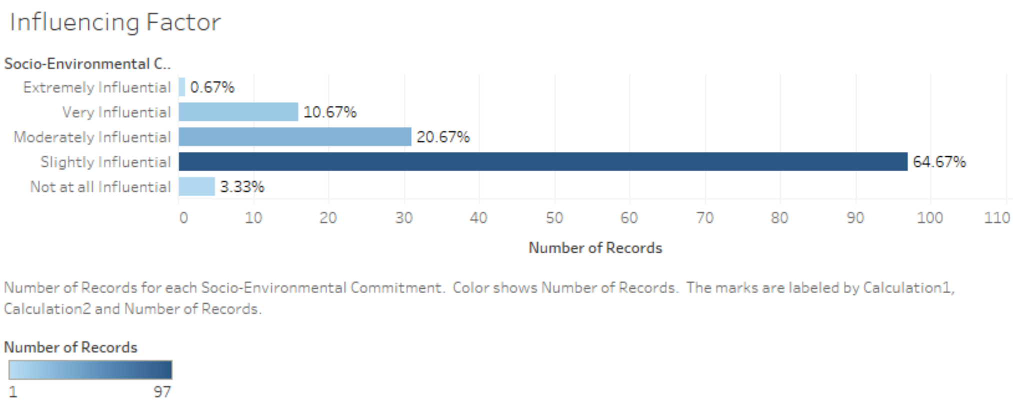

Fig. 6.18 Socio-Environmental Considerations

Global warming and climate change is now affecting the life of people in a more visible way. The extensive awareness creative drive has made people think to contribute their bit towards a sustainable planet. The respondents have suggested that this is only slightly influential. 64.67% of the respondents are of this opinion. 20.67% consider this as moderately influential while a minority considers this as extremely influential.

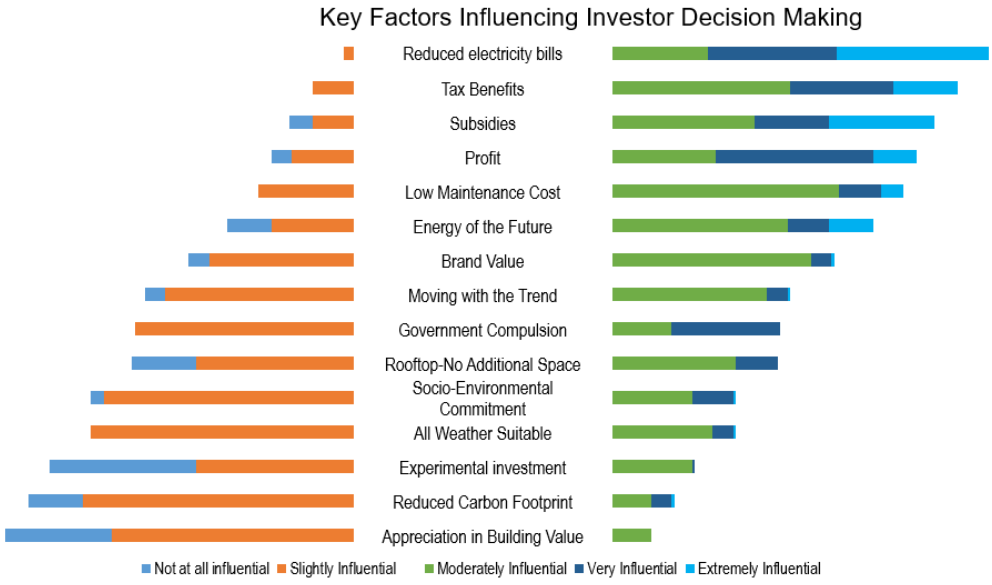

Fig. 6.19 Key Factors Influencing the Investment Decision

The above chart has ranked the positively impacting factors based on the degree of its influence. Based on the response the positive factors can be ranked as follows:

1) Reduced electricity bills
2) Tax Benefits
3) Subsidies
4) Profit
5) Low Maintenance Cost
6) Energy of the Future
7) Brand Value
8) Moving with the Trend
9) Government Compulsion
10) Rooftop-No Additional Space
11) Socio-Environmental Commitment
12) All Weather Suitable
13) Experimental investment
14) Reduced Carbon Footprint
15) Appreciation in Building Value

6.5 FACTORS NEGATIVELY INFLUENCING AN INVESTMENT DECISION

Various factors which are negatively influencing the investment decision are discussed in the following paragraphs.

6.5.1 INCONSISTENT POLICY MEASURES

The Inconsistency of policy measures is a major negatively influencing factor. If the policies are not consistent and there are frequent changes, the investors will lose the faith in the market.

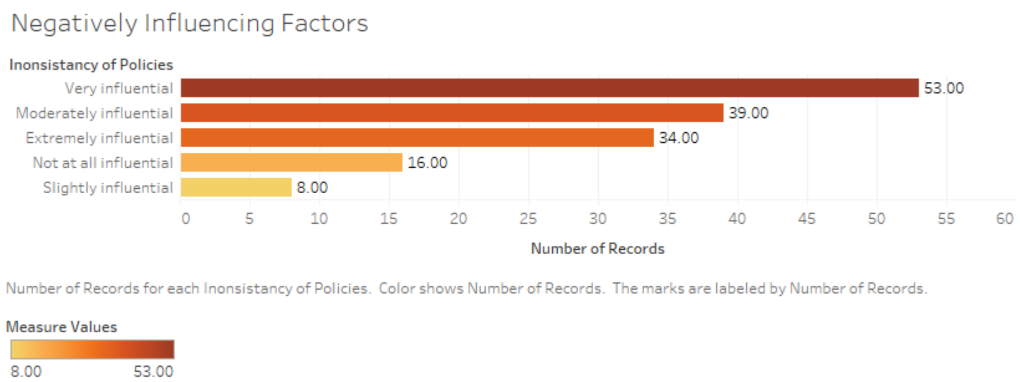

Fig. 6.20 Inconsistent Policies

From the respondents, 22.67% of the respondents consider this as extremely influential while 35.33% consider this as very influential. A total of 26% of the respondents said this has moderate influence on the investment decision.5.33% consider this as slightly influential and 10.67% consider this as not at all influential. Few of the respondents were concerned about expressing freely in favor or against any of the government policies. The apprehension may have made them to hint that the government policies has nothing to do with the investment decision. This has increased the bottom scale to 10.67%.

There are various factors which may have a negative impact on the investment decision. The respondents to the survey has rated various factors of negative impact on a scale of 1 to 5 with not at all influential to extremely influential. Various such influencing factors are discussed hereunder.

6.5.2 LACK OF SINGLE WINDOW CLEARANCE

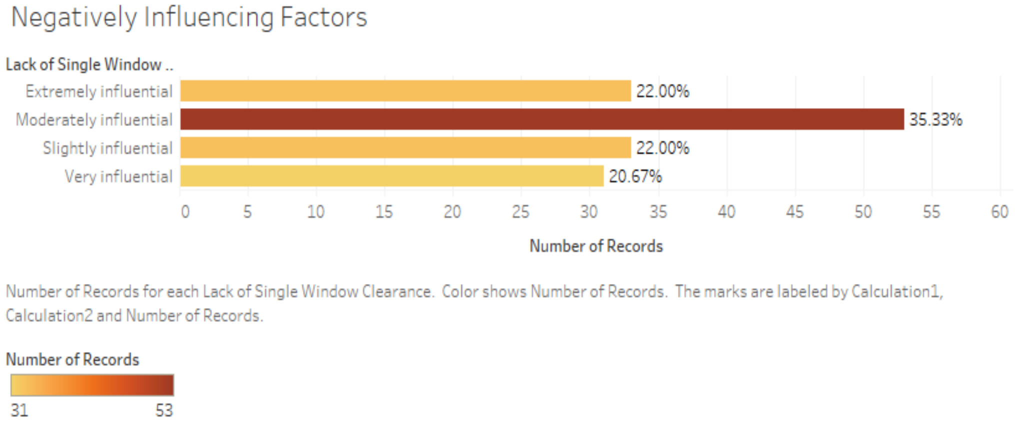

Fig. 6.21 Lack of Single Window Clearance

One of the important aspect of making ease of doing business is to create a single window for all the approvals and clearances. It is a nightmare for any investor to reach out to multiple counters for various clearances and to add further trouble to his peril is the corruption prevalent in the Indian bureaucracy.

The lack of single window clearance is a negatively influencing factor, with 22% considering it as extremely influential while 20.67% consider it as very influential. Investors and developers are of the opinion that due to various policies and administrative mechanisms followed by various states, there is lack of uniformity in the legal regime. It leads to have multiple strategies to be employed and multiple compliances to be followed by developers and investors for setting up a power plant. 35.33% of the investors consider this has moderate negative effect and 22% consider this has slightly negative influence on investment decision.

The multiplicity of clearances delays the execution of the project and increases the transaction cost and transaction time considerably. A detailed discussion of the same is included later in this chapter.

6.5.3 LACK OF FINANCING SOLUTIONS

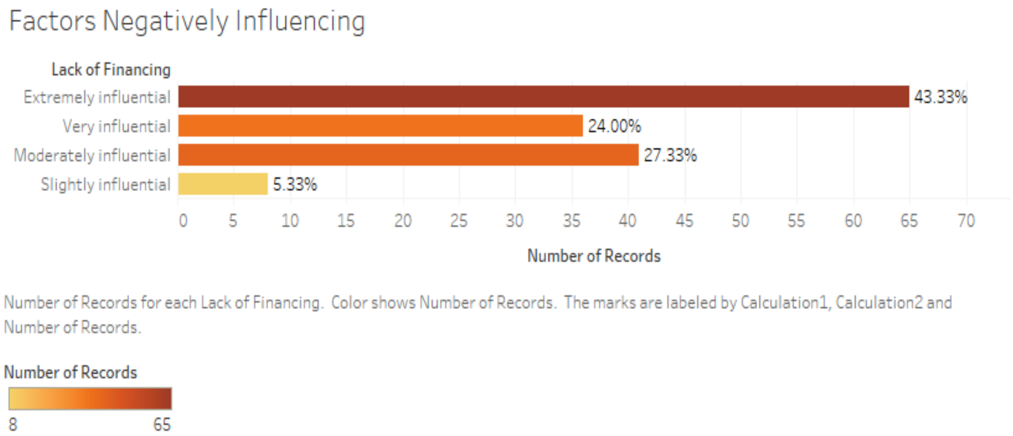

Fig. 6.22 Lack of Financing

Developers in the renewable industry prefer mostly a debt equity ratio of 70:30. It is important that banks provide loans to the intending developers to promote investments in the sector. There are various reasons for the banks and financial institutions to make renewable sector as less attractive. The financial health of the state owned DISCOMs which are the major buyers, causes delay in the payments to the developers. This makes increases the NPA pressure on the banks to eventually making the renewables a less attractive lending option for the banks and financial institutions.

Banks are also reluctant to provide loans because of the comparatively new and unproven technology and uncertainties in the future cash flow.

The lack of finance in the sector increases the financial burden and risk on the investor which eventually makes him to rethink on the investment. It is also important to get sufficient debt capital to make the business profitable. Even rooftop installations also find it difficult to obtain debt financing.

Utility scale solar farms are located beyond the service locations of the commercial bank branches. They are usually developed within the service boundaries of rural branches which primarily focus on agricultural financing and lacks expertise in evaluating the project. The officers in such branches prefer not to take risks by financing new business models.

Among the respondents 43.33% believe that this is extremely influential in the investment decision. 24% consider this as very influential while 27.33% has the opinion that lack of financing is moderately influential. A minority of 5.33% mostly representing residential investors consider this as only slightly influential for those who have determined to reduce the electricity bills for their home. None of the respondents have suggested this to be a non-influencing factor.

6.5.4 LACK OF SUBSIDIES

Subsidies is one major factor for driving the solar business. But there is considerable decline in subsidies and the government has withdrawn subsidies in few area. Subsidies are proven not to be not sustainable in the long run but the investor attitude is to get the maximum benefits from the government. 14% of the respondents consider this as extremely influential, 44% said it as very influential, 20.67% have suggested it to be moderately influential and 16% consider this as slightly influential. A minority of the residential investors consider this as not at all influential.

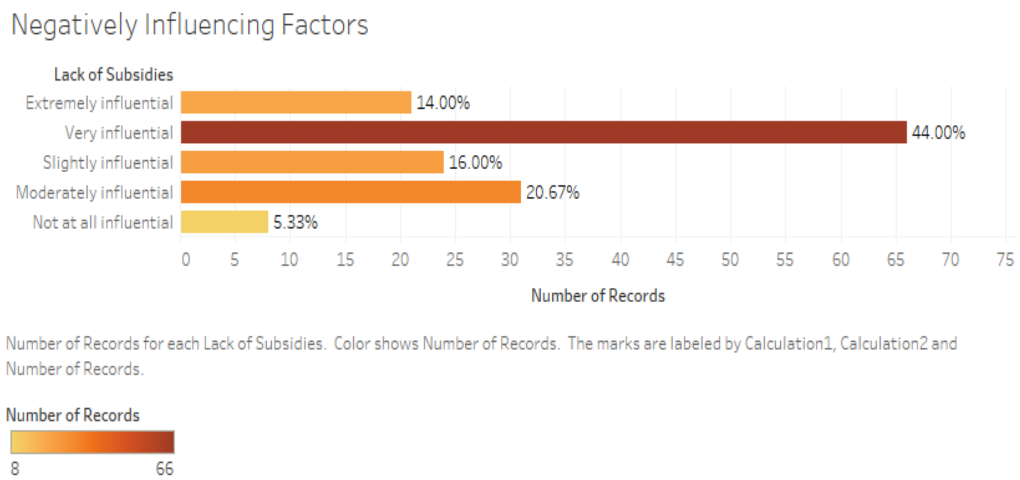

Fig. 6.23 Lack of Subsidies

6.5.5 LACK OF BUYERS

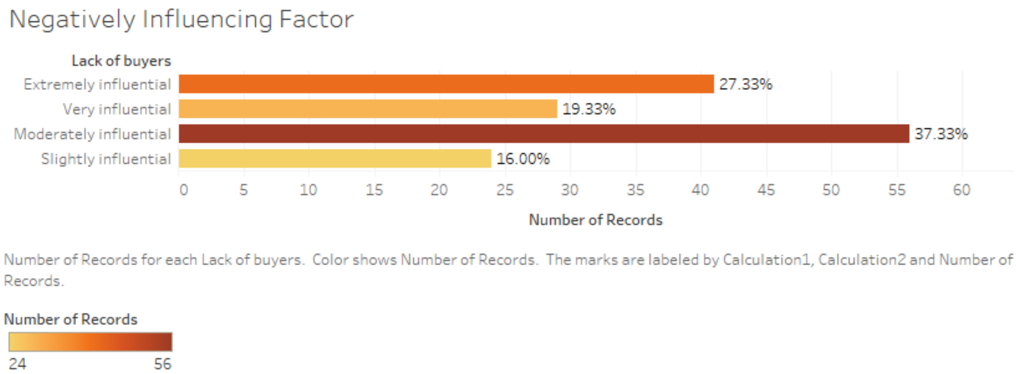

Fig. 6.24 Lack of Buyers

The government owned DISCOM is the only buyer available in most of the regions in India for renewable electricity. Even though open access has been in place since the Electricity Act 2003, it is restricted to the sale and purchase of 1MW or more electricity. Thus developers of less than 1MW of power has to rely on the power purchase agreements they have entered into with the DISCOMs. DISCOMs usually delay the payment for power they have purchased putting the developer and financier at risk.

27.33% consider this as extremely influential, 19.33% consider this as very influential, 37.33% suggested this as moderately influential and 16% opined it to be slightly influential deterring the investor from investing.

6.5.6 LACK OF EVACUATION INFRASTRUCTURE

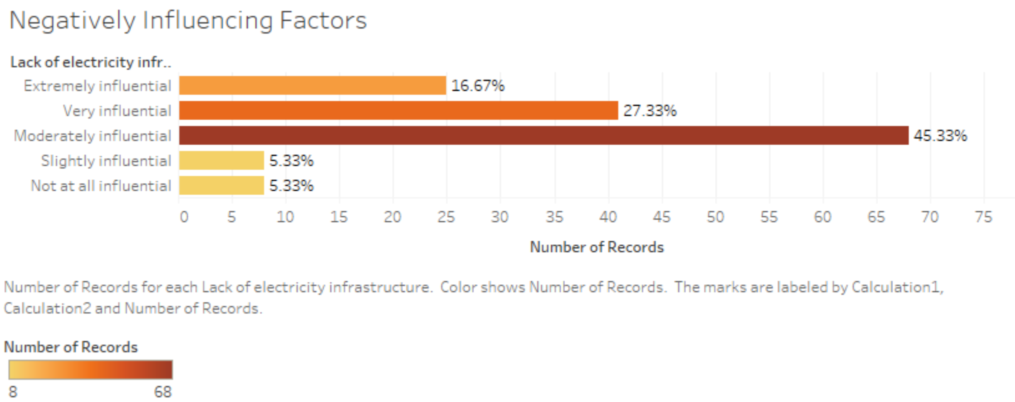

Fig. 6.25 Lack of Electricity Infrastructure

The Lack of electricity evacuation infrastructure can be of huge impact on the investment decision. This negatively affect the investment decision of the developers. In Kerala, the grid connectivity is not allowed more than 15% of the transformer capacity. Similarly other states also have made restrictions as to how much power can be transmitted to the grid due to the poor infrastructure for power evacuation. This prevents the developers for capacity addition and go for a higher output. This affects the developers' profits and costs as he may not be able to achieve the economies of scale.

16.67% of the respondents have marked this as extremely influential, 27.33% suggested this to be very influential and 45.33% opined it as moderately influential. A minority of respondents consisting of 5.33% have suggested that this has slight influence and another 5.33% said it to be not at all influential.

This is an influential factor for only grid connected solar. Standalone rooftop solar projects need not be affected by this. Thus a number of respondents have considered this as not a negative influencing factor.

6.5.7 RISK OF TECHNOLOGY GETTING OUTDATED

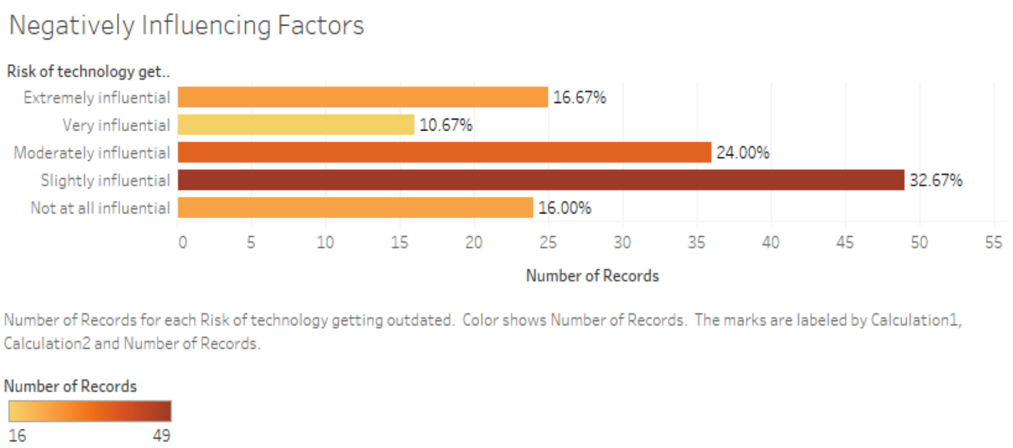

Fig. 6.26 Risk of Technological Change

Solar and other renewable energy technologies are still on the evolutionary trajectory with more innovations happening. There is a minor risk of the technology getting obsolete in the future. At the same time solar is being used for more than past 30 years.

16.67% are concerned of this risk factor as an extremely influential one, 10.67% consider this as very influential, 24% moderately influential. A greater number of people constituting 32.67% consider this as slightly influential while for 16% of the respondents this is not an influencing factor at all.

6.5.8 LACK OF SKILLED MANPOWER

National Institute of Solar Energy (NISE) is mandated with developing required skills in the solar electricity sector. But there lacks a nationwide shortage of skilled personnel in the sector. Many of the DISCOM employees are lacking the knowledge and understanding of the technology and creates difficulties in integrating the power with the grid.

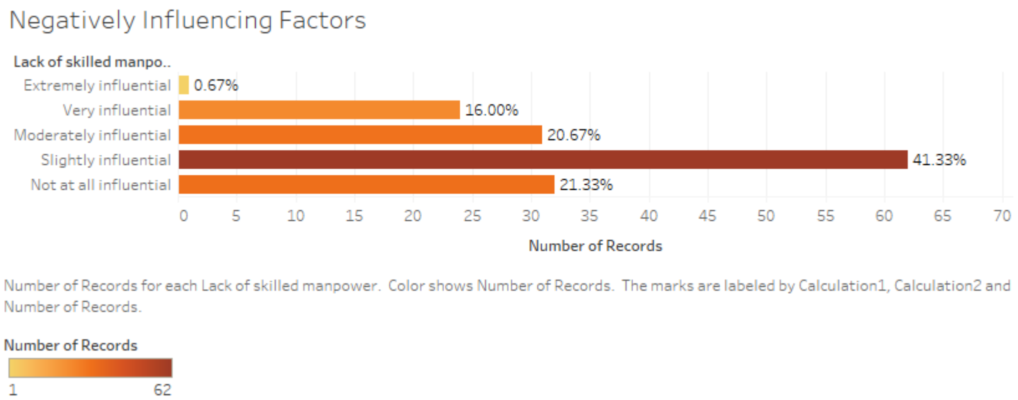

Fig. 6.27 Lack of Skilled Manpower

A fraction of the respondents constituting 0.67% consider this extremely influential, 16% said it to be very influential and a 20.67% consider this as moderately influential. 41.33% has opined this as slightly influential. Another 21.33% of the respondents are of the belief that this is not at all an influencing factor.

6.5.9 LOW PROFIT MARGIN

Those investors who seek business and profit from the investments are extremely demotivated at the low profit margins. Now the solar energy prices hitting new low every day, it is a concern for many of the investors. 22% of the respondents consider this as extremely influential, 15.33% think this to be very influential and for a 30% of the respondents this is moderately influential.

27.33% consider this as a slightly influential factor. 5.33% of the rooftop standalone investors do not consider this as a negatively influencing factor at all.

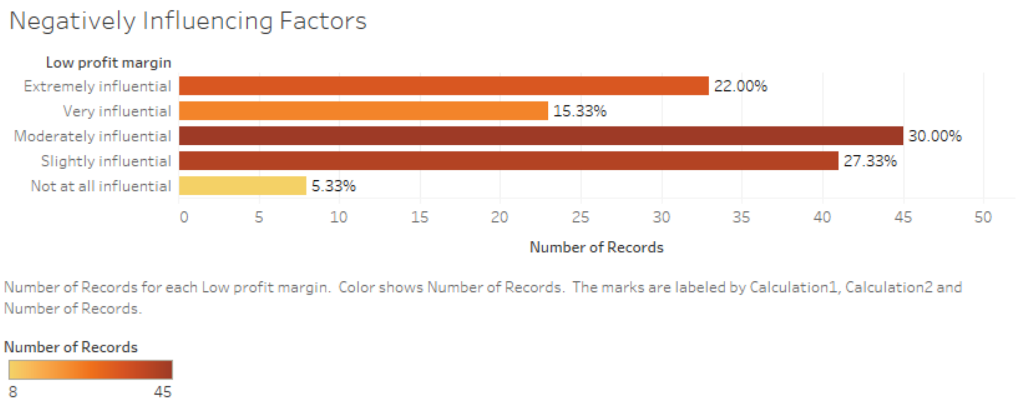

Fig. 6.28 Low Profit Margin

6.5.10 GEOGRAPHICAL CONDITIONS

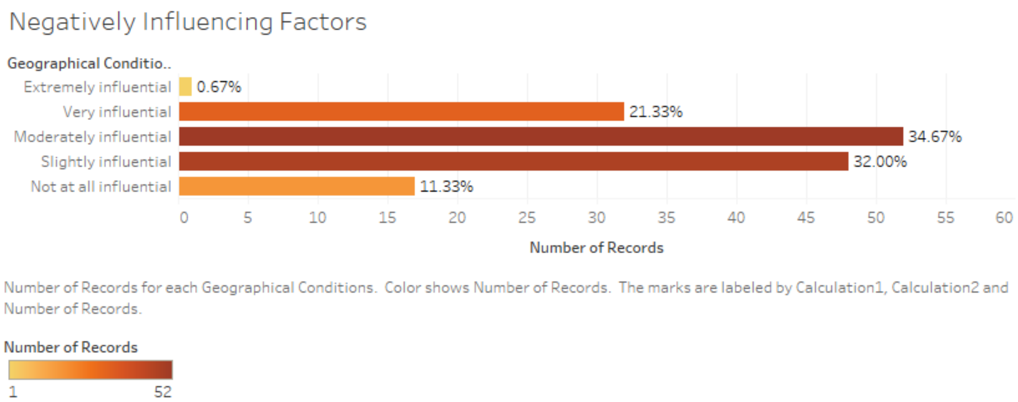

Fig. 6.29 Geographical Conditions

Geographical conditions are very important factors on the renewable energy development as it depends on the nature to produce energy. The location, irradiation etc. are important factors to be considered before making an investment decision. The availability of solar days is dependent on the geographic conditions. Among the respondents 0.67% consider this as extremely influential, 21.33% consider this very influential and 34.67% consider it as moderately influential. To a 32% this is slightly influential and another 11.33% consider this as not all influential.

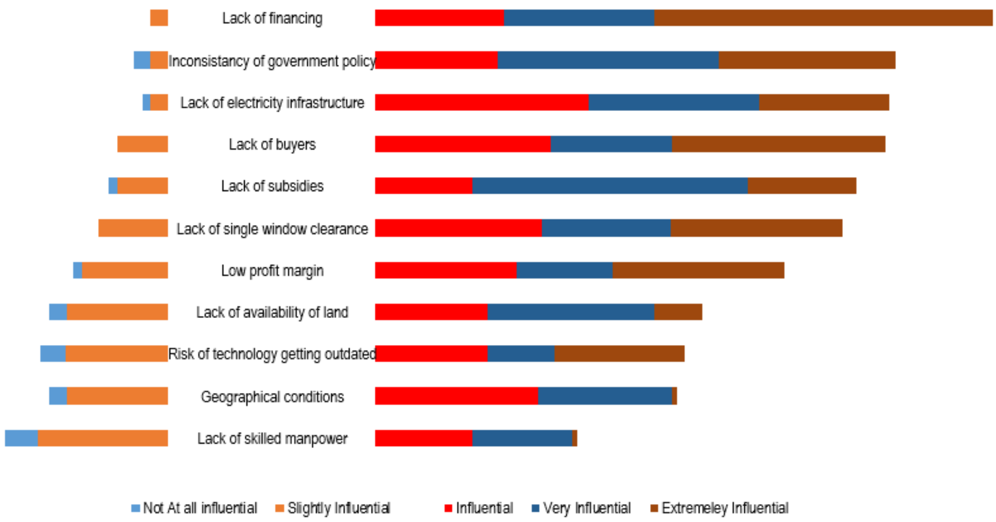

Fig. 6.30 Factors Negatively Influencing the Investor Decision

Based on the responses the negatively influencing factors can be ranked in the following order as the most negatively influencing and the least negatively influencing factors.

1. Lack of financing
2. Inconsistency of government policy
3. Lack of electricity infrastructure
4. Lack of buyers
5. Lack of subsidies
6. Lack of single window clearance
7. Low profit margin
8. Lack of availability of land
9. Risk of technology getting outdated
10. Geographical conditions
11. Lack of skilled manpower

6.6 CONCLUSION

There are many factors which are influencing an investment decision. But the average of the responses clearly suggest that it is the economic and financial concerns which are the determinant of all the investment decision making. Though this looks obvious to any prudent man, the survey has helped to rank various financial factors and non-financial which are impacting the investment decision. The factors which are positively impacting the investment decision include the consideration of reduced electricity bills as the primary factor with 4.09 score average, followed by subsidies with 3.51, tax benefits with 3.49, profitability with 3.37. All other factors have an average below 3, suggesting that the respondents do not consider them as a major influencing factor.

Among the negatively influencing, the following factors have a higher impact on the investment decision. Access to debt finance and the cost of the debt fiancé and the strict regulation for the credit worthiness, and the lack of understanding of the banking officials about the valuation of the project are causing the developers to get financing. Lack of financing with 4.06 average score is the major challenge in investment. Other major detracting factors include lack of multiple buyers with 3.58, lack of consistency of policy with 3.53, lack of government incentives, lack of electricity infrastructure, and lack of single window clearance all the three factors with 3.4 average score, and low profit margin with 3.22 average score has been identified as major detractors. Other factors have an average score less than three.

CHAPTER - 7

CONCLUSION

The solar energy development in India gained strength from Jawaharlal Nehru National Solar Mission which was launched in 2010. The capacity addition and investment data shows that the growth of the solar energy sector was nor positively or negatively affected by the Electricity Act 2003 though the lack of coordination of various agencies and the lack of importance given to it by various state government policies and commissions has curtailed its growth in many states. The need for additional policy push and promotion for investments required to be relooked at since it does not offer consistency. The way forward is to incorporate the consistent policy measures in the legislation to enhance growth in the sector.

The Electricity Act 2003 has laid down a comprehensive legal framework to ensure and protect the investors. In addition to the general framework for regulating the sector and creating a conducive environment for investment; the 2003 Act has included general provisions which may be helpful to promote and protect investors in the renewable energy sector. Since those provisions were enacted at a time when the renewable energy industry was at an infant stage, and many of the complexities of the sector were unknown to the lawmakers, it is expedient to have a more specific legislation instilling confidence in the investors.

Since we can find from the detailed discussion of the legal provisions that, there need a more coordinated mechanism at the national level is required to improve investment conditions. Some of the measures adopted by the government entities and regulators are discouraging the investors. It is important to understand what other laws may be complementing the growth of the sector.

It is vital that the Electricity Act 2003 shall have clear legislative provisions to address situations which may arise in the states where the investors are discouraged from selling the energy produced to entities other than the state utilities. It shall only in extra ordinary circumstances such a compulsion be made. The Act shall be amended to mean “extraordinary circumstances” under section 11 to include “severe scarcity of electricity” or add a new provision to enable the relevant authorities and agencies to meet the scarcity of electricity situations.

The failure of the utilities to make payments on time to the developers have affected their cash flow and has failed to meet the loan payout to various banking and finance firms which has resulted in reducing confidence of such institutions in providing loans to solar plants. Obtaining debt finance is a big challenge due to various factors and this need to be addressed by the government through new regulations in the banking sector for priority lending and allowing experiments in business models.

The major financing g challenge is to create security for the loans the banks give. Banks are not willing to give loans unless sufficient security is crated in favor of them. Roof top solar doesn’t use any land for installations, which makes it necessary to mortgage other immovable property to obtain the loan.

It can be observed that the functions of various authorities does not reflect the requirements for promoting sustainable and clean energy for India. The 2003 Act or any other rules and regulations which created various authorities under the 2003 Act does not mention the requirement of the authority to coordinate with the agencies under MNRE.

The state government and state regulatory commission measures do not sometimes go in consonance with the national renewable energy development program. The lack of communication and lack of coordination in planning further creates difficulties in the renewable energy sphere.

The cases discussed in the thesis clearly suggest that the market is still not entirely ready for the competition and the authorities also in some cases not taking necessary steps to implement the pure spirits and objectives of the 2003 Act. Improving the conditions of the market is vital for any sector to develop. With only the state distribution utility as the only buyer and the state governments makes mandatory requirements of selling the power produced only to the state utility is not an ideal market condition for any sector to develop into a competitive market place. It would be ideal to have more buyers and sellers to develop the sector and discover the true potential of the sector to energize the future India.

The general investment environment in India is improving as evidenced by the ease of doing business ranking. But there are many areas of concern which makes it difficult for doing business in India. In order to improve Investments in solar energy sector specifically, and in renewable energy generally, the ease of doing business has to be improved. Even though various central government ministries and many state governments have taken measures to improve the scenario, many of the renewable energy rich states lag behind in the ease of doing business in India index.

While the state governments have adopted policy measures to improve the renewable energy generation and capacity addition in the respective states, only few states which are bestowed with the abundance of resources in Renewable Energy has clear policies and plans to generate more electricity than their renewable purchase obligation.

The state policies focus on meeting local energy demand and supply which minute promote the national interest. It is thus necessary to have a comprehensive mechanism comprising of law policies infrastructure and governmental machinery to create a conducive environment for attracting private investments in the sector to meet National ambitions.

We need new investment models and new commercial instruments to deal with renewable energy sector investments. The current legal and policy framework in India is scattered without uniformity having no concurrency and lacks stability. The framework has failed to gain the confidence of investors due to abrupt policy changes causing losses for the investors. A robust national energy law should also be developed by assessing and evaluating various challenges addressing the energy trilemma.

Utility scale power plants require huge areas of land. The land requirements makes it impossible to establish huge power plants in cities. They find remote villages for installation of the power plants. The huge land requirement in such case is met by either getting barren land allotted from the government or taken on lease. Acquiring the land will increase the project cost, which is not ideal for developers since the energy cost will shoot up.

Understanding the particular interests of various stake holders like, the developer, the land owners and the financiers and tempering it against mutually agreed benefits of energy production at local levels can lead to creating more sector specific business models catering to the need to generate energy throughout India.

Global Institutional and policy framework addressing all the aspects of energy is required for the development of the energy sector in order to create a global order in the energy sector. Since climate change is s global phenomena, the world community cannot ignore creating such national legal and policy measures for the development of clean energy technologies and enabling world support system for those nations which lack resources to meet the clean energy adoption challenge their own.

There requires an overarching international energy law and policy framework, which is independent of the oil and gas legal and jurisprudential framework, that rests on the conflicting theory of ownership of the resources completely with the state, but failed to make the benefit reach to the masses. We need a new approach with legal and regulatory mechanism, which ensure abundant clean energy available, accessible and affordable to masses living in energy poverty and fuel economic growth.

There are many factors which are influencing an investment decision. But the average of the responses clearly suggest that it is the economic and financial concerns which are the determinant of all the investment decision making.

Though this looks obvious to any prudent man, the survey has helped to rank various financial factors and non-financial which are impacting the investment decision. The factors which are positively impacting the investment decision include the consideration of reduced electricity bills as the primary factor with 4.09 score average, followed by subsidies with 3.51, tax benefits with 3.49, profitability with 3.37. All other factors have an average below 3, suggesting that the respondents do not consider them as a major influencing factor.

Among the negatively influencing, the following factors have a higher impact on the investment decision. Access to debt finance and the cost of the debt fiancé and the strict regulation for the credit worthiness, and the lack of understanding of the banking officials about the valuation of the project are causing the developers to get financing. Lack of financing with 4.06 average score is the major challenge in investment. Other major detracting factors include lack of multiple buyers with 3.58, lack of consistency of policy with 3.53, lack of government incentives, lack of electricity infrastructure, and lack of single window clearance all the three factors with 3.4 average score, and low profit margin with 3.22 average score has been identified as major detractors. Other factors have an average score less than three.

The Electricity Act 2003 has provisions which delicensed and deregulated generation of electricity. But this was not sufficient to promote the clean energy technology investment. It was the financial incentives in the form of capital subsidies and accelerated depreciation which has given the adequate push to the sector to kick start. Still there are some major areas of concern in the electricity Act 2003, which the MNRE has recommended to amend, including the provisions relating to open access and renewable purchase obligation, the major provisions which facilitate renewable energy.

The general business environment in India is still need to improve. We have gained 77th rank in ease of doing business for 2019, but there are major areas of concern, including the enforcement of contracts. Renewable energy development depend on the power purchase agreements and the general trend in the sector for dishonoring power purchase agreements and the resultant litigation which further delays the business. Renewable energy production is not something which can be stopped or controlled. It need to be evacuated and the existence of a valid power purchase agreement at the time of generation of power is an essential condition.

There are some state government policies which mandate the sale of renewable energy produced only to the state utilities reduces completion in the market and is not allowing the producer or developer to seek out for other power buyers in the market. State government policies also deny the exemption from tax, wheeling charges and other duties if the electricity produced is sold outside the state, restricting the developers to sell the energy produced only within the state. This is not ideal for the development of the sector at the national level.

Structural changes in the Electricity Act 2003 alone is not sufficient. The Electricity Act 2003 is a comprehensive legislation which has provide the required foundation for the electricity industry to grow. What is required is the structural changes to the institutional arrangements in the sector. There should be a single ministry dealing with electricity and renewable energy. The proposed Electricity Act 2003 Amendment bill 2018 is delayed due to the lack of coordination between the Ministry of power and Ministry of New and Renewable Energy and various other authorities working under these ministries.

An improved electricity Act dealing with open access and renewable purchase obligations and a new institutional structure called National Energy Council, at the central level with state government participation in the model of GST Council is required to create the organizational and implementation framework for the improved law to achieve the desired results. In the absence of a National Energy Council in the GST Council model, the policies will vary from state to state and the creation of a successful national grid will be far from reality as the state governments will create islands of policies and regulations contradicting with other states making it difficult for large scale investors to invest throughout the country.

7.1 RESULT OF HYPOTHESIS

The existence of multiple agencies working with lack of coordination and inconsistent policy measures have failed to instill confidence in investors. Though some of the states are performing well in generating solar energy, optimization of such policy measures all over India is required to promote solar energy throughout the country. The study has revealed that India lacks an optimal legal framework to promote investments in renewable energy sector. Hence the thesis is proved. Hence the hypothesis is proved.

7.2 SUGGESTIONS

After analyzing the sector and various challenges it is facing now the following suggestions and recommendations are made.

1. The Electricity Act 2003 is a path breaking legislation. The 2003 Act was created at least a decade before the solar energy boom which started to unfold in the country. The Act requires amendment to accommodate the peculiar features of the solar and wind power with more detailed provisions dealing with the regulation, promotion and development of such sources of energy.

2. Open Access is the key to develop the sector. A more flexible cost effective and easily accessible open access environment need to be created. The Electricity Act 2003 need to create a robust legal framework for encouraging Open Access in the sector.

3. Barriers for open access from outside the state shall be removed. The tax benefits and duty exemptions providing to developers in the state only if the power generated is sold to state utility or within the state shall be removed to encourage a national market for open access.

4. There need to be a strong primary and secondary market created for strengthen the renewable purchase obligation mechanism and Renewable Energy Certificates. A real time energy market will help understand the power generation and pricing trends at real time. This will help the consumers to arrange their activities according to the power supply.

5. A real time data availability of energy production and consumption through extremely digitalized smart meter networks across the country will cater to a better energy exchange market.

6. Create and facilitate real time power generation monitoring throughout the country for real time power trade through a nationwide online market and digital system to manage the load on the transmission and distribution system.

7. We need to envisage an electricity market where a consumer, logs into his account purchase some units of power, makes prepayment or post payment and the power starts flowing to his premises. The consumer should be able to choose the suppliers of his choice.

8. Strengthen the infrastructure that can evacuate an increased power generation. The strengthening of the infrastructure is so important that during the day time when the energy production is high from renewables, the network should be strong enough to evacuate the whole of the power generated.

9. A strong system of energy storage need to be developed to store the excess energy produced. More investments in this area is required and the government need to provide an incentive mechanism for the development of storage systems.

10. Once the entire vehicle population get converted into electric vehicles by 2030 as envisaged in the draft national energy policy 2017, there require a network of charging stations. As the new technological development suggest, there will be fuel cell replacement centers across the nation. The existing petrol pumps may get converted into such fuel cell stations, which can also be the centers for storage of locally produced solar power. A nation Wide network of fuel cell centers can be the nationwide storage network, with the vehicle owners paying for such storage facilities of the excess power produced in a day.

11. Establish a single ministry for electricity with various departments to deal with each renewables. This will remove the inordinate delay in the

communication between the ministries and the electricity sector and its administrative mechanisms will be on the same page as that of the renewable energy sector and its administration.

12. Create a National Energy Council for policy making and regulation making for energy related aspects. The spirit of the Electricity Act 2003, is not yet trickled down to the bottom level. The state governments have their own political priorities which sometimes makes the clean energy technology development take a back seat. In the context of energy becoming national priority and the entire machinery need to move in tandem there require a unified policy making and implementation system.

13. A GST model National Energy Council becomes relevant when electricity is a concurrent subject and both center and state are empowered for its administration. It is vital to have concurrence among the state and central governments and policy decisions to avoid the complications of diverse legal framework to generate power. Currently an investor cannot predict to have the same experience he had in one state in another state.

14. Association for Renewable Energy Agencies of States (AREAS), a society registered under the Society Registration Act 1860 by MNRE and the Forum of Regulators notified under Section 166(2) of the Electricity Act 2003 points to the need to have a national level integrated mechanism for policy making and regulation of the sector to achieve high growth and move in the same direction. These bodies have no actual authority to drive the energy progress with the lack of legislative backing. A National Energy Council will address this issue.

15. There are research and development promoted in the technological development in renewable energy. More experiments in new business models and investment methods need to be carried out in the renewable energy sector.

16. More research is required to create the institutional and organizational arrangement of the National Energy Council. There is also scope for developing new business models in the sector through further research. Generally all commercial laws follow the developments in the business and try to regulate them. In the case of renewables, we need the business to grow by following the law we create in advance for its promotion. Thus we need to create a robust legislative and institutional framework for the sustainable energy future of this nation.

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APPENDIX

QUESTIONNAIRE

Ease of Doing Business in Renewable Energy in India Survey

* Required

1. Email address *

Personal Details

Please Provide the personal details to validate the data.

2. Name

3. Contact No.

4. Organization

5. Please describe the area of your expertise *

Mark only one oval.

- Manufacturing
- Engineering Procurement and Construction (EPC)
- Project Development
- Financing
- Consulting/Advisory/Academic
- Government/Regulatory
- Other: ______________________

6. Location of majority of your projects/office/Work

Mark only one oval.

- Andhra Pradesh
- Andaman and Nicobar Islands
- Arunachal Pradesh
- Assam
- Bihar
- Chandigarh
- Chhattisgarh
- Dadra and Nagar Haveli
- Daman and Diu
- Goa
- Gujarat
- Haryana
- Himachal Pradesh
- Jammu and Kashmir
- Jharkhand
- Karnataka
- Kerala
- Lakshadweep
- Madhya Pradesh
- Maharashtra
- Manipur
- Meghalaya
- Mizoram
- Nagaland
- National Capital Territory of Delhi
- Odisha
- Puducherry (Pondicherry)
- Punjab
- Rajasthan
- Sikkim

Sikkim

Tamil Nadu

Telangana

Tripura

Uttar Pradesh

Uttarakhand

West Bengal

7. Please select one power plant and capacity in relation to which the following questions will be answered.

Check all that apply.

	5 KW	50 KW	100 KW	500 KW	1 MW	100 MW
Rooftop Standalone	☐	☐	☐	☐	☐	☐
Rooftop Grid Connected	☐	☐	☐	☐	☐	☐
Ground Mounted Standalone	☐	☐	☐	☐	☐	☐
Ground Mounted Grid Connected	☐	☐	☐	☐	☐	☐

Time

Time calculated from the time of application till the approval of each permit. 24 hrs is counted as one day.

8. How much time it takes to obtain various ELECTRICAL permits for establishing a Solar project?

Check all that apply.

	Upto 15 days	15 to 30 Days	30 to 90 days	more than 90 days	Don't Know
Feasibility Analysis by DISCOM	☐	☐	☐	☐	☐
Registration of the plant with DISCOM	☐	☐	☐	☐	☐
Connectivity permits	☐	☐	☐	☐	☐
Concluding Power Purchase Agreement	☐	☐	☐	☐	☐
Inspection & Commissioning	☐	☐	☐	☐	☐
Power Evacuation Permit	☐	☐	☐	☐	☐

9. How much time it takes to obtain OTHER permits (mark which ever is relevant) for establishing a Solar project?

Check all that apply.

	Don't Know	Upto 15 days	15 to 30 Days	30 to 90 days	more than 90 days
Building Permit	☐	☐	☐	☐	☐
Land Conversion Certificate	☐	☐	☐	☐	☐
Contract Labor License	☐	☐	☐	☐	☐
Environmental Clearances	☐	☐	☐	☐	☐
Sewage Treatment Approval	☐	☐	☐	☐	☐
Fire and Safety Certificate	☐	☐	☐	☐	☐
Clearance from Forest Department	☐	☐	☐	☐	☐
Permit from MNRE for Tax Exemption	☐	☐	☐	☐	☐

10. How much time it takes to obtain a loan to FINANCE Solar project?

Mark only one oval per row.

	7 days	Up to 15 days	Up to 30 days	more than 30 days	More than 90 days	Don't Know
Time Taken for getting credit from a financial institution	◯	◯	◯	◯	◯	◯

Cost

11. How much is the cost to obtain various ELECTRICAL permits for establishing a Solar project?

Check all that apply.

	less than 1% of the project cost	between 1% to 5% of the project cost	between 5% to 10% of the project cost	More than 10%
Feasibility Analysis by DISCOM	☐	☐	☐	☐
Registration of the plant with DISCOM	☐	☐	☐	☐
Connectivity permits	☐	☐	☐	☐
Concluding Power Purchase Agreement	☐	☐	☐	☐
Inspection & Commissioning	☐	☐	☐	☐
Power Evacuation Permit	☐	☐	☐	☐

12. How much cost is involved to obtain OTHER permits (mark which ever is relevant) for establishing a Solar project?

Check all that apply.

	less than 1% of the project cost	between 1% and 5%	between 5% and 10%	more than 10 %
Building Permit	☐	☐	☐	☐
Land Conversion Certificate	☐	☐	☐	☐
Contract Labor License	☐	☐	☐	☐
Environmental Clearances	☐	☐	☐	☐
Sewage Treatment Approval	☐	☐	☐	☐
Fire and Safety Certificate	☐	☐	☐	☐
Clearance from Forest Department	☐	☐	☐	☐
Permit from MNRE for Tax Exemption	☐	☐	☐	☐
Any other	☐	☐	☐	☐

13. What are the interest rates at which a bank loan is provided to a developer of a Solar Plant?

____

14. What is the current capital cost for per Watt of Power?

In Rupees (INR)

Mark only one oval.

- Less than 30
- 30-40
- 40-50
- 50-60
- 60-70
- 70- 80
- 80-90
- 90-100
- 100-110
- 110-120
- Above 120
- Other

15. What is the current rate of return on investment?

Please provide the return on investment in %

Mark only one oval.

- Less than 10%
- Between 10 and 15 %
- Between 15 and 20 %
- Between 20 and 30 %
- Above 30 %
- Other: ____________________

Factors Influencing Investment Decision

16. How do you rate the following factors that may positively influence a developer to invest in solar energy?

Mark only one oval per row.

	Not at all Influential	Slightly Influential	Moderately Influential	Very Influential	Extremely Influential
Reduce electricity bills	◯	◯	◯	◯	◯
Subsidies	◯	◯	◯	◯	◯
Tax benefits	◯	◯	◯	◯	◯
Appreciation in the value of the building	◯	◯	◯	◯	◯
No additional space requirement	◯	◯	◯	◯	◯
Reduction in carbon footprint	◯	◯	◯	◯	◯
Compulsion from the government	◯	◯	◯	◯	◯
Suitable for all weather climate	◯	◯	◯	◯	◯
Energy of the future	◯	◯	◯	◯	◯
Low Maintenance	◯	◯	◯	◯	◯
Profits from the sale of electricity	◯	◯	◯	◯	◯
Experimental investment	◯	◯	◯	◯	◯
Increase brand value by going green	◯	◯	◯	◯	◯
Moving with the trend	◯	◯	◯	◯	◯
Socio-Environmental Commitment	◯	◯	◯	◯	◯

17. Which among the following will influence a person's decision not to invest in renewable energy

Mark only one oval per row.

	Not at all influential	Slightly influential	Moderately influential	Very influential	Extremely influential
Current Policies and Regulations	◯	◯	◯	◯	◯
Lack of Single Window Clearance	◯	◯	◯	◯	◯
Lack of Financing	◯	◯	◯	◯	◯
Lack of Subsidies	◯	◯	◯	◯	◯
Lack of buyers for the energy	◯	◯	◯	◯	◯
Lack of electricity infrastructure	◯	◯	◯	◯	◯
The risk of technology getting outdated in future	◯	◯	◯	◯	◯
Lack of skilled manpower	◯	◯	◯	◯	◯
Economic conditions- Profits & Rate of return	◯	◯	◯	◯	◯
Geographical conditions	◯	◯	◯	◯	◯
Availability of Land	◯	◯	◯	◯	◯

18. Which of the following are the most determinant and extremely influential factors in an investment decision?

Mark only one oval per row.

	Least Determinant	Determinant	Highly Determinant
Current Government policies	⬭	⬭	⬭
Regulatory compliances	⬭	⬭	⬭
Single window clearance	⬭	⬭	⬭
Availability of Finance	⬭	⬭	⬭
Level playing field for Solar compared to conventional energy	⬭	⬭	⬭
Market prices for renewable electricity	⬭	⬭	⬭
Access to transmission network	⬭	⬭	⬭
Number of buyers	⬭	⬭	⬭
Availability of Land	⬭	⬭	⬭
Profit margin	⬭	⬭	⬭

19. Suggestions

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Ideal Investment Scenario

Please chose an ideal scenario for investment in Renewable Energy

20. Select One power plant and capacity

Please answer all other queries in this section in relation to the plant type and capacity you are selecting

Check all that apply.

	5 KW	50 KW	100 KW	500 KW	1 MW	100 MW
Rooftop Standalone	☐	☐	☐	☐	☐	☐
Rooftop Grid Connected	☐	☐	☐	☐	☐	☐
Ground Mounted Standalone	☐	☐	☐	☐	☐	☐
Ground Mounted Grid Connected	☐	☐	☐	☐	☐	☐

21. What is the ideal time within which all Preliminary and Pre-operational clearances need to be completed?

Mark only one oval.

- Less than 15 Days
- One Month
- 3 Months
- 6 Months
- Other: ______________________

22. What is the ideal cost to obtain all Preliminary and Pre-operational clearances?

Only fees and other legally payable charges are considered

Mark only one oval.

- No Costs
- Less than 1% of the total investments
- Less than 5% of the total investments
- Other: ______________________

23. What is the ideal capital cost for per Watt of Power?

In Rupees (INR)

Mark only one oval.

- Less than 30
- 30-40
- 40-50
- 50-60
- 60-70
- 70- 80
- 80-90
- 90-100
- 100-110
- 110-120
- Above 120

24. What is the expected return on investment?

Please provide the return on investment in %

Mark only one oval.

- Less than 10%
- Between 10 and 15 %
- Between 15 and 20 %
- Between 20 and 30 %
- Above 30 %
- Other: ______________________

25. What is the preferred debt equity ratio

Debt Capital : Equity Capital (D : E)

Mark only one oval.

- 70:30
- 80: 20
- 60:40
- Other: ______________________

26. Please suggest an ideal interest rate for debt capital

Rate of interest

Mark only one oval.

- Less Than 5%
- Less Than 10%
- Less Than 15%
- Less Than 20%
- Other: ______________________

27. Any other suggestion

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RESUME SUMMARY

Associate Professor with ten years teaching and two years litigation experience. Have offered courses including Taxation Laws, Corporate Governance, Company Law, Indirect Tax Laws and Civil Procedure Code to graduate and post graduate students. Delivered important administrative responsibilities in addition to the academic role. Pursuing Ph.D in Laws relating to Renewable Energy Investments and completed LLM (Business Laws) from NLSIU Bangalore (2009).

EDUCATION

Ph.D. (Thesis submitted on 21st Dec 2018)

University of Petroleum and Energy Studies, Dehradun

LL.M. (Business Laws) 2007-09

National Law School of India University, Bangalore

LL.B., Cochin 2003-06

School of Legal Studies, Cochin University of Science and Technology, Cochin

B.Com.(Taxation)

Sacred Heart College, Cochin, Mahatama Gandhi University Kottayam

Winter Course on International Taxation, 2015

Indian Society of International Law, New Delhi

Training Program on Mediation: The principles & practice, 2008

National Law School of India University, Bangalore.

EXPERIENCE

January 2020 to Present

Associate Professor and HoD, Center for Postgraduate Studies, School of Law, Presidency University Bangalore

Offered Competition Law, Law of Corporate Governance, Trial Advocacy

January 2019 to present

Assistant Professor, School of Law, Alliance University Bangalore

Offered core course Law of Taxation and seminar course on Law of Insurance

Offered specialized honors courses of Law of Mergers and Acquisitions and Law of Insurance

September 2016 to December 2018

Assistant Professor, School of Law, Presidency University Bangalore

Courses offered include Law of Taxation, Civil Procedure Code to graduate law students and Business Laws to MBA students

July 2010 to August 2016

Assistant Professor, School of Law, University of Petroleum and Energy Studies, Dehradun

Courses offered include Law of Taxation, Law of Contracts, Company Law

February 2010 to June 2010

Assistant Professor, Arunachal Law Academy, Itanagar

Courses offered include Law of Contracts, Banking Law, Constitutional Law

December 2006 to July 2007 & June 2009 to January 2010

Associate Lawyer, S Krishnaprasad & Co. Lawyers, Cochin

Appearances before Hon'ble High Court of Kerala and subordinate courts.

PUBLICATIONS AND CONFERENCES

Publications

Sujith Surendran & Dr. Tabrez Ahmad, The Need for a Legal Definition of "Sustainable Energy" for a Sustainable Future, 2 Energy Law Reports 95–105 (2016). Available at SSRN: https://ssrn.com/abstract=2852926

Sujith Surendran & Dr. Tabrez Ahmad, Need for a Comprehensive Renewable Energy Law, IJMLSS, Vol 2, Issue 2, October 2017, 19-26

Sujith Surendran & Dr. Tabrez Ahmad, The Required Policy Change for India's Energy Security, IJTSRD, Vol 1, Issue 6, October 2017, 1020-1026

Conferences

National

Sujith P Surendran "Nuclear Energy: The Fuel for Transition Phase", in the Two-Day National Seminar on Sustainable Energy Future in India Law, Policy and Management on 18th and 19th September 2017 at National Law School of India University, Bengaluru.

Sujith P Surendran, "Specialized Law Programs" in the Two-Day National Workshop on Integrated Double Degree Courses in Law- Critical Reflections on 21st and 22nd January 2017 at Government Law College, Kozhikode.

Sujith P Surendran, "Balancing of Economic Development and GST" in the Three-Day National Seminar, "Legis Actio 2017" on on Goods and Service Tax from 21st to 23rd February 2017 at Government Law College, Kozhikode

International

Sujith P Surendran "The Structural Analysis of The Renewable Electricity Sector in India Using Institutional Analysis and Development (IAD) Framework" in the international conference on Redefining Diversity and Dynamism of Natural Resource Management in Asia, on July 13 - July 16, 2018 at Asian Institute of Technology, Bangkok.

Sujith P Surendran "Access to Energy and alleviation of poverty: A policy Analysis" in the International Conference on Dimensions of Poverty and Happiness in Economy on 9th and 10th September 2017, at Ecumenical Christian Centre, Bangalore, organized by School of Humanities and Social Sciences, Jain University, Bangalore.

Sujith P Surendran **"**International Seminar on Water Laws and Resource Management: Challenges and Way Ahead", on 3rd and 4th Nov 2017, organized by the School of Law, UPES Dehradun

SESSION CHAIR, TRAINING AND FDP

Faculty development program on "absolute justice, medical negligence and teaching research from the left" organized by school of law, IMS Unison University, Dehradun during January 9-10, 2016 at school of law, Dehradun

Entrepreneurship development program on solar energy, organized on 20th and 21st May 2017 at Bangalore by ministry of skill development and entrepreneurship, government of India

Judge, paper presentation, national youth summit- vision 2020 organized by icareindia at Tula's institute, Dehradun on 28th April 2012.

Chaired a session on Uttarakhand's first renewable energy summit organized by icareindia at Tula's institute, Dehradun on 19th November 2011.