iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** XI **Month of publication:** November 2022

DOI: https://doi.org/10.22214/ijraset.2022.47522

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue XI Nov 2022- Available at www.ijraset.com

Green Energy -Overview

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Abstract: Green energy definition, Source of Green energy, India' s Energy scenario and demand of Renewable energy, Green energy types, Renewable Energy -outlook, Financing option for Green Energy and Importance of Green Energy. Green Energy is the primary source of reducing the India's Carbon foot print.

I. INTRODUCTION

Environmental concerns have attracted the attention of a wide variety of countries all around the world. As there is depletion in the non-renewable energy sources and there is concern of the non-renewable energy polluting the atmosphere, the renewable energy industry has emerged as a driver of economic growth and possesses a significant untapped potential for expansion. Realizing the ideal allocation of resources, finding a solution to the problem of overcapacity, and choosing the appropriate manner of selection of Technology is essential. In an era in which the nexus between energy and climate change has acquired the dominant position on the policy agenda and demands deliberate energy sector interventions to stop the immediate threats of climate change, the primacy of energy has received a newfound impetus, giving it a new lease on life as the most important resource. Recent years have seen huge shifts in India's energy systems and structures, in part because of the country's strategic policy emphasis on the promotion of renewable energy sources. India is one of the economies across the world that is developing at the fastest rate.

This is also consistent with India's growing strategic relevance on the world arena as a nation that is increasingly taking the spotlight in the global order for renewable energy sources. The fact that India took the initiative in establishing the International Solar Alliance (ISA) on December 1, 2015, with the purpose of galvanising concerted global efforts to address the challenges posed by climate change, is a glaring illustration of the strategic importance that the country possesses. Conscious policy decisions to encourage the use of renewable energy sources have become essential in light of the rapidly increasing domestic energy demand resulting from rapid economic expansion, urbanisation sparked by programmes like Smart Cities and recent industrialization initiatives like "Make in India." It is also anticipated that this will add over 600 million new energy consumers by the year 2040, resulting in a major rise in demand. According to a number of studies, there will be a significant increase in the demand for energy in the country, which would result in a capacity increase from the current level of 300 gigawatts (GW) to more than 1,000 gigawatts (GW) by the year 2040. (IEA 2015). As a result, determining the country's future energy trajectory in a way that is more secure, environmentally friendly, and technologically advanced appears to be a tough endeavour. As a result of ongoing various distortions, the energy sector in India is likely to face a number of difficult challenges. The poor financial health of power distribution utilities, and infrastructural-related constraints. India is notorious for being an energy-deprivation hotspot, with per capita electricity availability close to one-third below the global average and over 239 million people still lacking bare minimum access to electricity (IEA 2017). In spite of the existence of such anomalies, a transition to a low-carbon regime that places a particular emphasis on renewable energy appears to be a potentially fruitful course of action. The beginnings of such shifts can already be seen in their early stages. For instance, the year 2017 was recognised as a watershed year in the annals of renewable energy development in the country primarily due to two important considerations: the first is that for the first time in the history of India, the addition of renewable energy capacity has outpaced the addition of conventional energy capacity (BNEF 2017); the second is that the year 2017 also witnessed an unprecedented fall in the price of renewable energy, in particular the price of solar energy (Buckley and Shah 2017). India is world's 3rd largest consumer of electricity and world's 3rd largest renewable energy producer with 40% of energy capacity installed in the year 2022 (160 GW of 400 GW) coming from renewable sources. India has also set a target of producing 175 GW by 2022 and 500 GW by 2030 from renewable energy. As of September 2020, 89.22 GW solar energy is already operational, projects of 48.21 GW are at various stages of implementation and projects of 25.64 GW capacity are under various stages of bidding. In 2020, 3 of the world's top 5 largest solar parks were in India including world's largest 2255 MW Bhadla Solar Park in Rajasthan and world's second-largest solar park of 2000 MW Pavgada Solar Park Tumkur in Karnataka and 100 MW Kurnool in Andhra Pradesh. Wind power in India has a strong manufacturing base with 20 manufactures of 53 different wind turbine models of international quality up to 3 MW in size with exports to Europe, United States and other countries. Nevertheless,

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the procedure of making this shift to a low-carbon energy system is not an easy one. The development of renewable energy has a number of structural, governance, and institutional obstacles; yet, the promise makes it worthwhile to consider developing a strategy. The structure of ownership in the renewable energy sector in India is another factor that contributes to the country's difficulties in this area. The private sector is the primary driver of renewable energy, in contrast to the public sector for traditional types of energy. This is clear from the fact that whereas two-thirds of conventional power production capacity is directly owned by Central and State governments, in the case of renewable energy, the full burden of developing the sector rests with the private sector. To be more specific, one of the key roadblocks that looks to lie in the way of achieving the lofty goal of 175 GW of installed renewable energy capacity by 2022 appears to be the inability to acquire affordable and sufficient financing (Shakti Foundation and Crisil India 2015). It appears to be a more difficult task because the private sector in India is responsible for the development of renewable energy sources. This sector is more sensitive to the risks and uncertainties connected with this endeavour. In light of this, the current study offers a critical evaluation of the funding options for renewable energy projects in India.

II. CORE PROBLEM

The majority of the world's energy requirements are satisfied by the use of fossil fuels (Non-Renewable Energy). These non-renewable projects lead to an increase in the emission of greenhouse gases into the atmosphere, which, in turn, leads to an increase in the rate of global warming. In order to decrease the amount of greenhouse gases emitted into the atmosphere, the world is shifting its investment towards renewable projects, also known as green energy. The renewable energy sector in India is the fourth most attractive renewable energy market in the world. As of the year 2020, India held the fourth-ranked position for wind power, the fifth-ranked position for solar power, and the fourth-ranked position for renewable power installed capacity.

III. GREEN ENERGY

Green energy is any energy type that is generated from natural resources, such as sunlight, wind or water. It often comes from renewable energy sources although there are some differences between renewable and green energy.

Green energy is any energy type that is generated from natural resources, such as sunlight, wind or water. It often comes from renewable energy sources although there are some differences between renewable and green energy, which we will explore, below

Energy to be qualified as green energy, a resource cannot produce pollution, such as is found with fossil fuels. This means that not all sources used by the renewable energy industry are green. For example, power generation that burns organic material from woods other plant materials may be renewable, but it is not necessarily green, due to the CO2 produced by the burning process itself.

Green energy sources are usually naturally replenished, as opposed to fossil fuel sources like natural gas or coal, which can take millions of years to develop. Green sources also often avoid mining or drilling operations that can be damaging to eco-systems.

Green energy is important for the environment as it is alternative for the effects of fossil fuels with more environmentally-friendly alternatives. Derived from natural resources, green energy is also often renewable and clean, meaning that they emit no or few greenhouse gases and are often readily available. Even when the full life cycle of a green energy source is taken into consideration, they release far less greenhouse gases than fossil fuels, as well as few or low levels of air pollutants. This is not just good for the planet but is also better for the health of people and animals that have to breathe the air. Green energy can also lead to stable energy prices as these sources are often produced locally and are not as affected by geopolitical crisis, price spikes or supply chain disruptions. The economic benefits also include job creation in building the facilities that often serve the communities where the workers are employed. Renewable energy saw the creation of 11 million jobs worldwide in 2018, with this number set to grow as we strive to meet targets such as net zero. Due to the local nature of energy production through sources like solar and wind power, the energy infrastructure is more flexible and less dependent on centralised sources that can lead to disruption as well as being less resilient to weather related climate change.

A. Types Or Sources Of Greeen Energy

There are many types of green energy coming from a wide variety of sources. Some of these types are better suited to specific environments or regions, which is why there are so many renewable energy that filter into the energy grid.

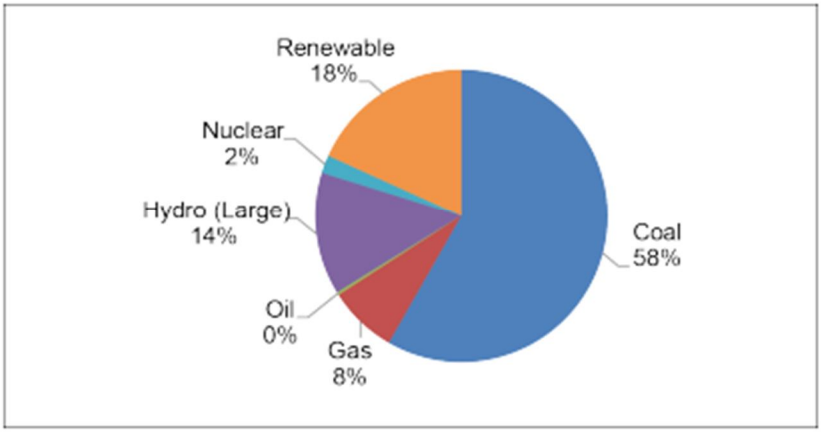
1) Solar Energy
2) Wind Energy
3) Hydroelectric Energy
4) Biomass
5) Biogas
6) Green Hydrogen

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue XI Nov 2022- Available at www.ijraset.com

IV. RENEWABLE ENERGY IN INDIA: A BRIEF OUTLOOK

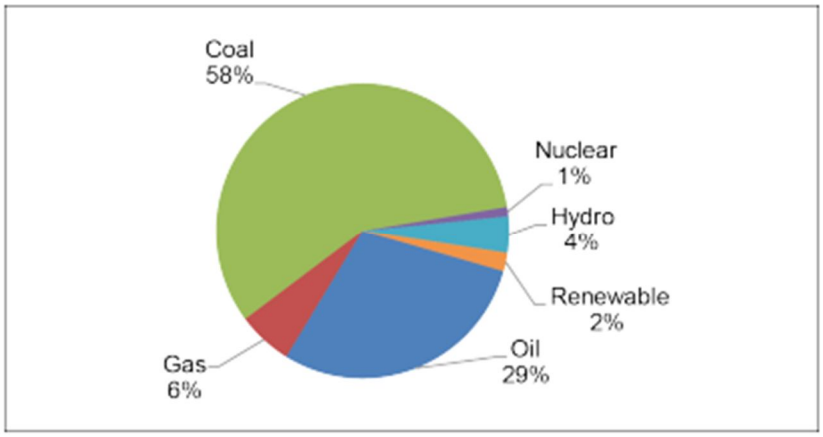
One may argue that the worldwide oil crisis of the late 1980s was the seed that eventually grew into the growth of renewable energy in India. Since that time, the Government of India has been making a concerted effort to promote the renewable energy sector by enacting a variety of regulatory and policy measures that are strategic in nature. In light of the fact that the Constitution designates energy as a concurrent item (entry 38 on the concurrent list), periodic strategic policy initiatives aimed at expanding the renewable energy sector are formulated both by the federal government and by the governments of the provinces. These initiatives are taken with the intention of addressing the constitutional status of energy as a concurrent item. Nevertheless, the most recent governmental push to transition to a greener energy regime is expressed in the transformative energy vision that the Government of India has to produce 175 GW of renewable energy by 2022. Additionally, India's Intended Nationally Determined Contributions to the United Nations Framework Convention on Climate Change (UNFCCC) reaffirm this emphasis (INDCs). It is abundantly obvious that policy-level priority on renewable energy are being placed with the global climate commitment to source 40 percent of its energy from renewable energy by the year 2040. (GoI 2015b). Not only this, but the existing energy mix also suggests such shifting policy focus on energy generation with a progressively bigger part of renewables in the country's energy basket. This is in addition to the fact that the present energy mix already indicates such changing policy focus. The installed capacity of the country is broken down into its many sources in Figure 1. The energy consumption in source wise is indicated in the Figure 2.

Figure 1: Energy Mix by Installed Capacity in India in 2017



Source: CEA (2017).

Figure 2: Primary Energy Consumption in India in 2016



Note: Renewables (including biofuels).
Source: BP (2018).

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The mapping of primary energy use, on the other hand, does not actually point to such a transformation, and the fundamental reason for this is an excessive reliance on oil products and biofuels (Figure 2). This unequivocally demonstrates that rural India is still reliant on the usage of fossil fuels for its fundamental energy needs. This also demonstrates that India still has a long way to go before it has completely transformed its energy system. On the other hand, renewable energy as a source of electricity has been rapidly supplanting traditional forms of energy in the country in recent years. This can be deduced from the numerous growth estimates that have been made for the country about renewable sources of energy.

For instance, one of the goals outlined in the National Action Plan to Combat Climate Change (NAPCC) is to increase the use of renewable energy to 15 percent by the year 2020. The "heroic scenario" developed by NITI Ayogo offers an extremely ambitious future aim of 410 gigawatts (GW) of wind power and 420 gigawatts (GW) of solar power by the year 2047. (GoI 2014). The IEA's New Policy Scenario contains the most significant projections issued by any organisation (IEA 2015). It is estimated that the country's capacity to generate electricity will increase by more than three times by the year 2040, with a compound annual average growth rate of approximately 7 percent per year. Within the context of the New Policies Scenario, the IEA has provided the comprehensive projections that may be seen in Table 1

Table 1: Power Generation Capacity by Type in India in the New Policies Scenario
(GW)

					Shares (%)		CAAGR*
	2014	2020	2030	2040	2014	2040	2014–2040
Fossil fuels	204	280	419	576	71	53	4.1
Coal	174	230	329	438	60	41	3.6
Gas	23	41	76	122	8	11	6.6
oil	7	9	13	15	3	1	2.9
Nuclear	6	10	24	39	2	4	7.6
Renewables	79	147	304	462	27	43	7
Hydro	45	58	83	108	15	10	3.5
Wind	23	50	102	142	8	13	7.2
Solar PV	3	28	100	182	1	17	16.4
Other	7	11	18	30	3	3	5.5
Total	289	436	746	1076	100	100	5.2

V. FINANCING OPTIONS FOR GREEN ENERGY

Some of the most important categories of financing choices that may be made when it comes to the financing of renewable energy technology (RET) projects. Additionally, it will detail the financing choices that are most consistent with the model of project financing. These choices are categorised as direct or indirect financing options, and they address some hurdles while also defining the level of risk that is engaged and assumed by various stakeholders who invest in and finance projects related to renewable energy technologies. It will go on to explain further elements that should be taken into account or that influence which financing solutions should be chosen to be utilised.

Some of the financing options as provided below:

1) Grant and Guarantees
2) Debt Financing
3) Equity Financing.
4) Corporate Financing.
5) Bank Financing.

Table 3: Commitments Made by Different Financial Institutions for Renewable Energy

Bank	Share of Total Committed Amount (%)
SBI	12.6
IREDA	10.9
Yes Bank	10.2
Indus bank	9.3
India Infradebt	8.2
PTC India Financial Services	5.4
Union Bank of India	5.3
Bank of Baroda	4.2
IDFC	20.2
L & T Finance Holdings	13.7

Source: CFA (2018).

VI. CONCLUSION ON GREEN ENERGY

Traditionally we have relied on materials such as coal, oil, and even kerosene for the energy we need. However, these fuels are non-renewable and expel pollution into our environment and atmosphere. As such, these sources will eventually run out, causing fears about shortages and access to them. But what's worse, is the environmental harm they inflict.

Burning these conventional sources of energy fuels resulted in global warming. Coal and oil pour toxic gases into the environment, impacting health, and causing respiratory issues, and reducing live expectancies. Simply extracting oil and coal can destroy areas environments, economies, and livelihoods in the form of devastating oil spills.

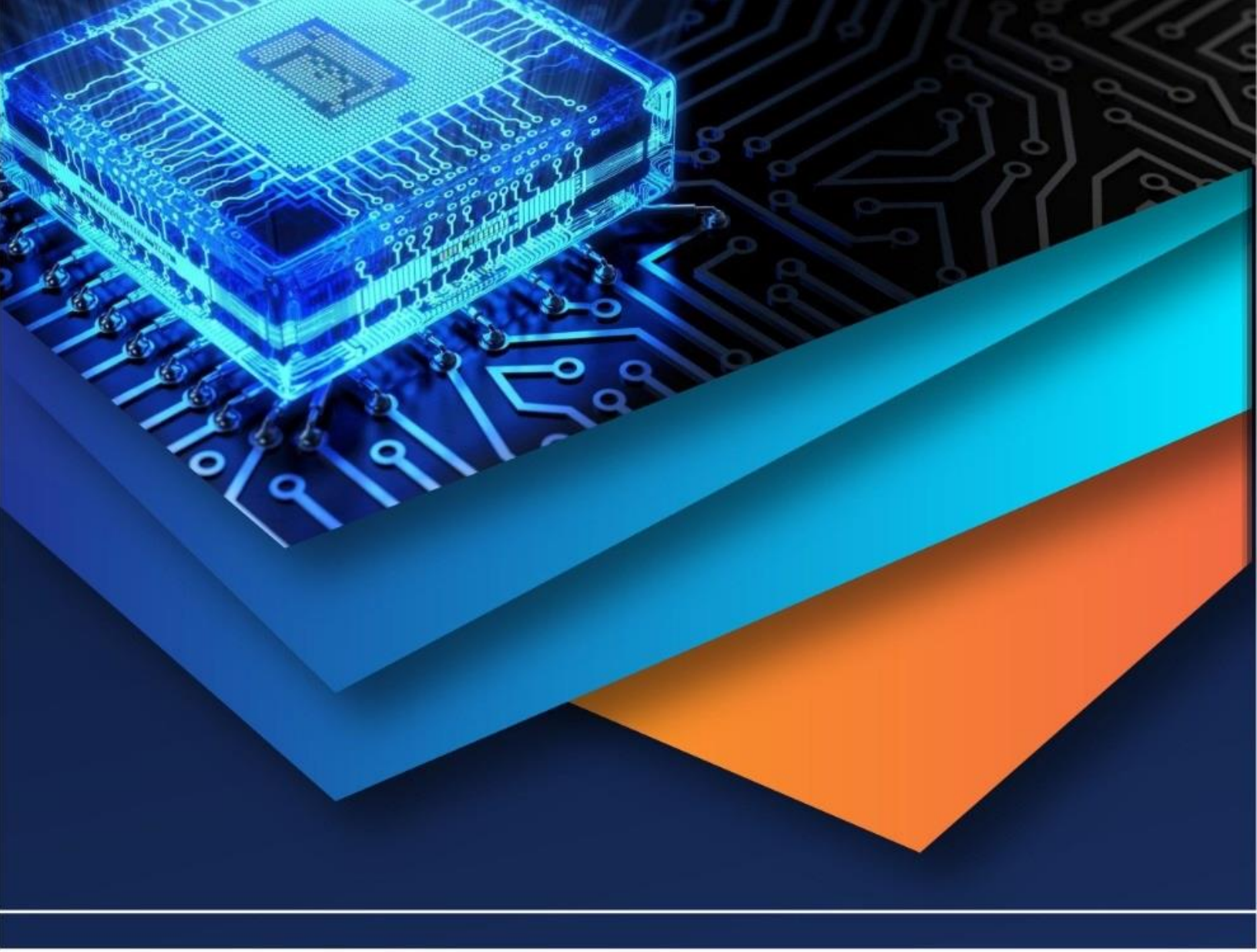
Green energy will help us mitigate and sidestep at least some of these issues, and the quicker we move to renewable energy sources the better.

BIBLIOGRAPHY (REFRENCES)

[1] International Energy Agency. Available online: http://www.iea.org/ (accessed on 26 November 2017).
[2] Bloomberg New Energy Finance. Available online: https://about.newenergyfinance.com/about/ (accessed on 2 December 2017).
[3] BNEF. 2017. Accelerating India's clean energy transition. India: Bloomberg New Energy Finance (BNEF). https://about.bnef.com/blog/accelerating-indias-clean-energy-transition/.
[4] BP. 2018.BP Energy Outlook: Country and regional Insights-India. https://www.bp.com/content/dam/bp/en/corporate/pdf/energy- economics/energy-outlook/bp-energy-outlook-2018-country-insight-india.pdf.
[5] Buckley, T., Shah, K. 2017.India's Electricity Sector Transformation. Institute for Energy Economics and Financial Analysis. Cleveland, US. http://ieefa.org/wp-content/uploads/2017/11/India-Electricity-Sector-Transformation
[6] _Nov-2017-3.pdf,
[7] CEA. 2017. Executive Summary 2017. India: Central Electricity Authority (CEA),Ministry of Power, Government of India.
[8] CFA. 2018. Coal vs Renewables: Financial Analysis. New Delhi: Centre for FinancialAccountability.
[9] Chaudhary, A., Krishna, C., and Sagar, A. 2014. Policy Making for Renewable Energyin India: Lessons from Wind and Solar Power Sectors. Climate Policy 15 (1): 58–87.
[10] CoPU. 2017. Financing of renewable energy projects by Indian Renewable Energy Development Agency Limited. 22nd Report of Committee on Public Undertakings 2017-18.
[11] CPI. 2012. Meeting India's Renewable Energy Targets: The Financing Challenge.Climate Policy Initiative (CPI).http://climatepolicyinitiative .org/wp-content/uploads/2012/12/Meeting-Indias-Renewable-Targets-TheFinancing- Challenge .pdf.
[12] CSE. 2017. Using the National Clean Energy Funds to Clean Coal Power Plants. Policy Brief, Centre for Science and Environment. http://www.cseindia.org/userfiles/NCEF.pdf.
[13] GoI. 2016. A Report by Energy and International Cooperation Vertical. NITI Aayog, Government of India. http://indiaenergy.gov.in/wp-content/uploads/2017/09/Knowledge-Initiatives.pdf.
[14] ———. 2015a. Report on India's Renewable Electricity Roadmap 2030. NITI Aayog, Government of India. http://shaktifoundation.in/wp-content/uploads/2014/02/ Report-on-Indias-RE-Roadmap-2030-full-report-web2.pdf.
[15] ———. 2015b. India's Intended Nationally Determined Contributions.Ministry of Environment. Forest and Climate Change, Government of India.http://pib.nic.in/newsite/PrintRelease.aspx?relid=128403.

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[16] ———. 2014. Futuristic Energy Scenarios. Planning Commission.Government ofIndia.http://pib.nic.in/newsite/PrintRelease.aspx?relid=108292.
[17] GIZ. 2015. The Role of the Private Sector to Scale up Climate Finance in India.
[18] Germany: GI. https://www.giz.de/de/downloads/giz2015-en-nama-india-private-financial-institutions-climate-finance-final-report.pdf.
[19] IEA. 2017. World Energy Outlook. Paris: International Energy Agency.https://www.iea.org/weo2017/.
[20] IEA. 2015. India Energy Outlook 2015. Paris: International Energy Agency. https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf .
[21] ———. 2014a. India: Balances for 2015. Paris: International Energy Agency. https://www.iea.org/statistics/statisticssearch/report/?year=2015&country=INDIA&product=Balances.
[22] ———. 2014b. World Energy Investment Outlook 2017. Paris: International EnergyAgency. https://www.iea.org/publications/wei2017/.
[23] https://www.twi-global.com/technical-knowledge/faqs/what-is-green-energy#HowDoesGreenEnergy.



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