IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Vol. 2, Issue 3, <May> 2022
Impact Factor:

Solar Renewable Energy for Sustainable Development in India: Current Status, Future Prospects, Challenges, Employment

Shalaka Patil and Shabana Memon
Bharati Vidyapeeth (Deemed to be University), Institute of Management, Kolhapur, Maharashtra, India
shalakapatil87@gmail.com; shabana.memon@bharatividyapeeth.edu

Abstract: *As the scarcity of conventional energy sources like coal, petroleum, natural gases are increasing and causing the environmental and climatic changes, use of natural resources is growing in the recent years. Solar energy is playing a key role in compensating the electrical energy short fall. India is running one of the largest and most ambitious solar renewable capacity expansion programs. Solar energy is one of the key elements of socio-economic development and also responsible for sustainable jobs creation in the society. This paper aims to present significant achievements, prospects, generation of electricity as well as challenges and investment and employment opportunities due to the development of solar renewable energy in India. In this review, we have identified the various obstacles faced by the renewable sector. The recommendations based on the review outcomes will provide useful information for policymakers, entrepreneurs, solar industries, associated stakeholders, researchers, and scientists.*

Keywords: Solar energy status, challenges, opportunities, employment

I. INTRODUCTION

Conventional energy sources are finite and under depletion also has environmental impact. Electricity generation is the main cause of industrial air pollution as electricity comes from coal, nuclear, and other non-renewable power plants. Conventional energy sources contribute to polluting air, land, and water. The oil crisis in the 1970s pushed the Government to focus from coal to renewables. This coupled with the early 1990s financial crisis and engagement of the private sector in industrial development, brought about by the liberalization and industrialization of the Indian economy in 1991 triggered a growth of the renewable energy sector [2]. Renewable energy is generated from the natural process and It's available continuously for usage. Use of renewable energy helps the environment also contribute in socio economic development of the country.

Sun is one of the renewable resource, solar energy used the energy comes from sun. Solar Panels made up of solar cells are one of the key components to convert the sunlight into electricity. The basic components of the solar power plant are Solar Panel, Inverter, AC, DC protection devices, cables and earthing, lighting protection.

The study of the sustainable source of energy is important due to several reasons, Firstly the conventional energy sources are diminishing as the demand rises. So, moving towards the alternative source is future need, it is important to focus on the challenges facing by customer as well as installer so can be addressed and perspective towards going green of the society can be changed. the survey shows that there are more than 600 solar companies in Maharashtra itself which increases the competition in the solar market. So, to stand in the market organizations need to concentrate on the various business strategies for bright future of the company. In this paper will focus on current status of the solar renewable energy in India, the limiting factor of solar energy, steps to overcome the limiting factors and employment opportunities in the solar field.

As of September 2021, India had 101.53 GW of renewable energy capacity and represents ~38% of the overall installed power capacity. The country is targeting about 450 Gigawatt (GW) of installed renewable energy capacity by 2030 – about 280 GW (over 60%) is expected from solar [3].

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

II. LITERATURE SURVEY

More than 50 Published paper, government websites, reports and renewable field expert opinion are considered for the literature review some of them as listed below

LITERATURE REVIEW					
Sl No	**Title**	**Author**	**Journal**	**ISSN/ISBN**	**Take away points**
1	Review on power generation from non-conventional energy source in India	Rakesh Sukhdeo Patil, Vikaskumar Mhetre	JETIR	ISSN-2349-5162	1) Solar energy potential in India and current status of solar energy 2) Problems and challenges in solar energy 3)Government Acts and Policies
2	Status of Conventional Energy Sources and Solar Energy in India	Mitali Yadav & Geetika Mishra	JETIR	ISSN-2349-5162	1)Share of renewable energy in total installed capacity 2) Government schemes 3) Challenges in solar sector
3	Attitude toward and Awareness of Renewable Energy Sources	Mohammed Alqarni	Science Direct	23 December 2020	1) Public awareness 2) Assessment of energy sources based on purchase
4	The Impacts of Policies and Business Models on Income Equity in Rooftop Solar Adoption	Eric O'Shaughnessy	Berkeley Lab	Lawrence Berkeley Laboratory	1)Consumer aspects of high and medium income towards solar energy 2) The impacts of policy and business model on PV adoption
5	Factors Affecting Green Purchase Behaviour and Future Research Directions	Yatish Joshi and Zillur Rahman	ELSEVIER	Volume 3, 1–2, June–December 2015	2) Factors affecting the purchase behaviour
6	Factors Affecting Sustainable Market Acceptance of Residential Microgeneration Technologies.	Spyridon Karytsas	Semantic Scholar	27 August 2019	1)Socioeconomic and Environmental awareness 2) Factors related to consumer behaviour, attitudes and attribute preferences.
7	The Potentials of Renewable Energy	Thomas B Johansson	REN21	Article	1) Environmental and Social issue 2) Market development for renewable Energy
8	Role of Renewable Energy in Indian Economy	Aaditya Ranjan Srivastava	IOP Science	doi:10.1088/1757-899X/404/1/012046	1) Government efforts to promote renewable energy 2) Job Creation

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

9	Renewable Energy Benefits: Measuring the Economics	Rabia Alvaro Lopez-Peña	IRENA	IRENA	1)Socio-economic effect 2) Effect of economic dimension-consumption and Investment, Social dimension-employment, spending on health and education
10	Energy entrepreneurship business models innovation	Michael Hamwi and Iban	Researc h Gate	September 2018	1)Business model in the energy sector 2) Demand response business model 3) Energy efficiency business model combination
11	Business Models for Energy Entrepreneurship in Emerging Markets	Ellen Abrams, Kevin Bosma	SEAS	School for Environme nt and Sustainabili ty	1)Factors do entrepreneurs perceive as having the greatest influence on success of their venture 2) Factors within clean energy ecosystem do industry experts perceive as entrepreneurial success 3) Factors do entrepreneurs perceive as having the greatest influence on successful interactions across the clean energy value chain 4) Analytical Framework -Business Operation, Financing, Policy, Regulation, and Governance, Country demographic and Customer characteristics
12	Entrepreneurship and Innovation in Energy and Environmental Technologies; Barriers and Opportunities	Ramiar Sadegh-Vaziri	KTH	Stockholm, Sweden 2013	1)Environmental concerns and Sustainability 2) Three different phases of technology development: research, demonstration and commercialization. 3) Categories of consumers like Percentage within each category, Rate of adoption of innovation 4) Governmental influence
13	India could create millions of jobs through renewable energy	Sameer Kwatra&C harlotte	Article	NRDC	1)Employment status in solar renewable energy 2)Steps to be taken to increase the employment in the renewable field
14	Renewable Energy Report-Report Feb 22		IBEF	IBEF	1)Installed Solar Capacity 2) Opportunities in Solae Renewable Field

Summary

- India has low conventional energy resources compared to its required energy needs driven by a huge population and a rapidly increasing economy. However, India can harness the huge potential of solar energy as it receives sunshine for most of the year.
- The Solar renewable energy has the great future ahead and contribute in social and economic growth of the country.
- Employment in the industry has increased from last few years.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

- Still there is less awareness in society about the renewable sources, Low and moderate-income households are less likely to adopt solar photovoltaics than higher income households.
- Solar renewable industry facing challenges like social, technological, regulatory and financing challenges
- Still there is lack of customer centric model where he can understand the basic of technology is required for them, economic viability of different product available in market and what will be rate of returns on investment.
- Most of the organizations are not able to focus the sales and marketing strategies due to cost implications and capital budgeting.
- Most of the time subsidies develop are not able to reach to end user about the policy so government/ service provider should make aware about it, should be hassle-free and in line with time.

In primary data collection method Questionaries on solar renewable field focusing on customer, government policy, financial aspects and installer are prepared. Feedback from various solar installer for sustainable business in market contribute to research.

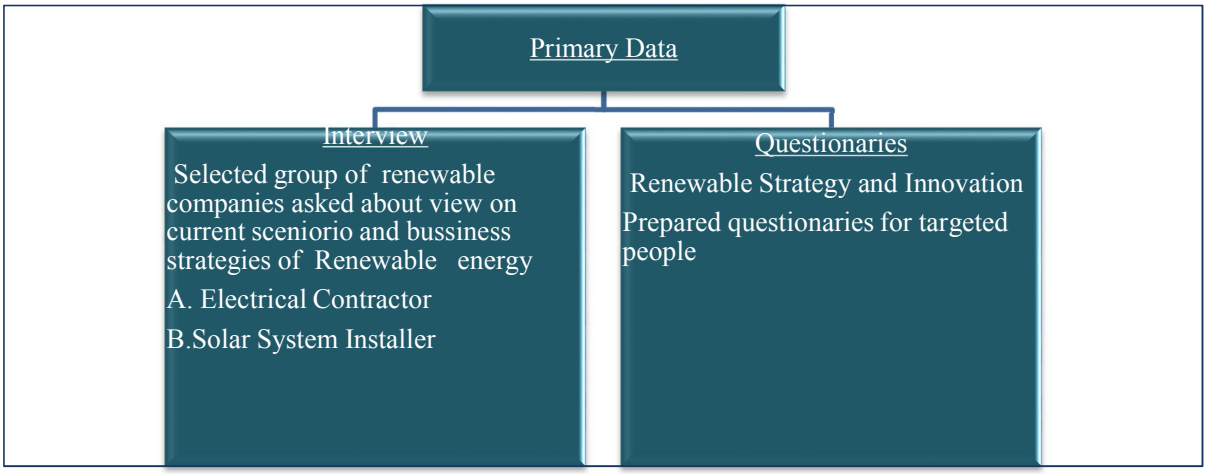


Fig. 1. Primary Data Collection Methods

Secondary data considered as published data on government websites, reports, related research studies in various journals and opinion of renewable field expert.

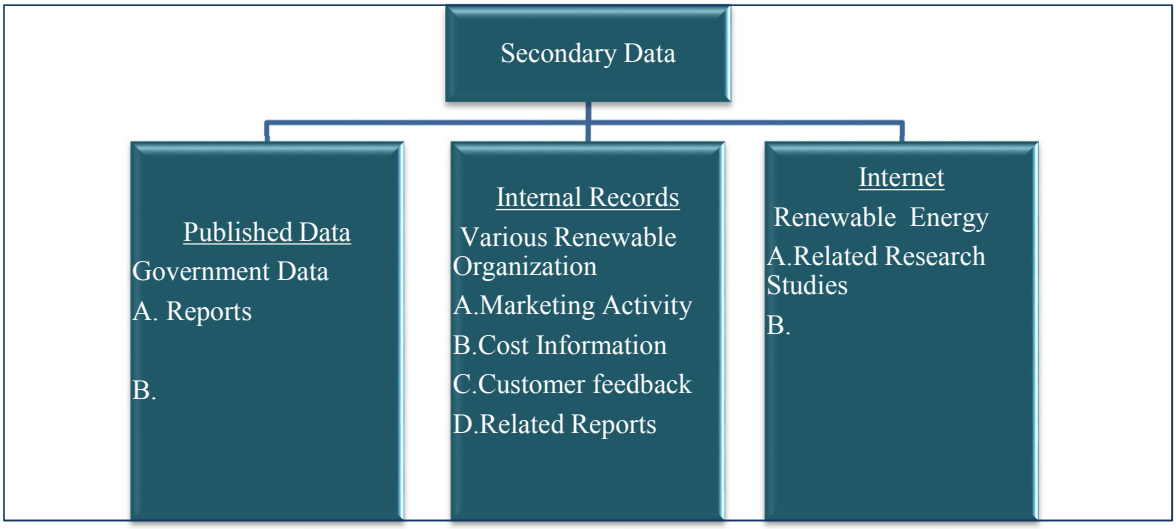


Fig. 2. Secondary Data Collection methods

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

III. IMPLEMENTATION

We concentrate on solar renewable energy try to find out the current status of solar renewable energy, barrier in adoption of the solar energy, steps to overcome the barrier and sustainable business practices in the solar energy market. The Fig.3. shows the steps follows in the research process.

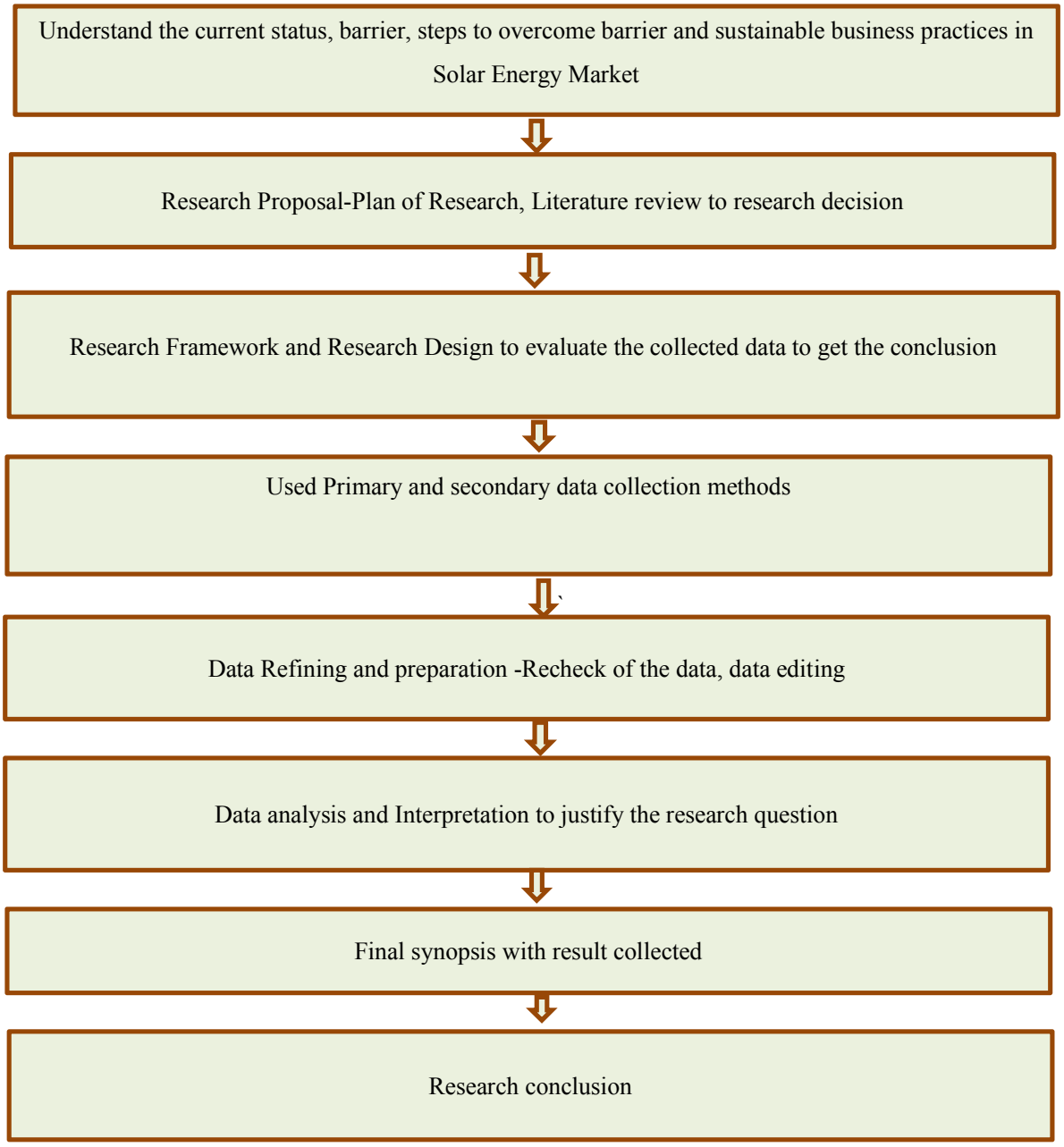


Fig.3. Flowchart of the research process

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

Current status of the solar renewable energy in India

Solar power in India is a fast developing industry as part of the renewable energy in India.[33] The country's solar installed capacity was 53.997 GW as of 31 March 2022

The Fig. 4 graph shows the solar capacity installed and solar power generations through the installed power plant, we can year by year solar installation and solar power generation are increasing Solar electricity generation from April 2020 to March 2021 increased to 60.4 terawatt-hour (TWh) from 50.1 TWh in the same period a year ago. Solar has the great future ahead.

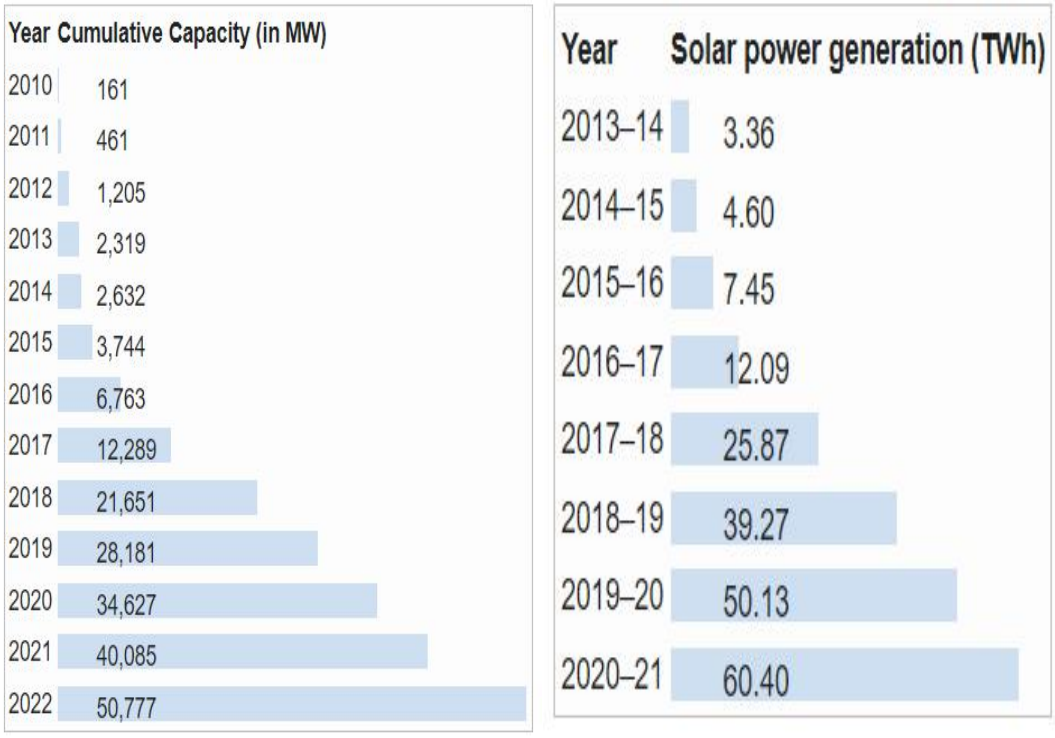


Fig. 4. Solar installed cumulative capacity and solar power generations

During 2010-19, the foreign capital invested in India on Solar power projects was nearly 20.7 billion US$[34].

The International Solar Alliance (ISA), proposed by India as a founder member, is headquartered in India. India has also put forward the concept of "One Sun One World One Grid" and "World Solar Bank" to harness abundant solar power on global scale[35][36].

In January 2016, Prime Minister Narendra Modi and French President François Hollande laid the foundation stone for the headquarters of the International Solar Alliance (ISA) in Gwal Pahari, Gurugram. The ISA will focus on promoting and developing solar energy and solar products for countries lying wholly or partially between the Tropic of Cancer and the Tropic of Capricorn. The alliance of over 120 countries was announced at the Paris COP21 climate summit [37].

Future Opportunities in solar renewable field

In December 2020, Prime Minister Mr. Narendra Modi unveiled a plan to create at least one 'green' city in each state that will be powered by renewable energy sources, primarily solar energy [41]. India was ranked fourth in wind power, fifth in solar power and fourth in renewable power installed capacity, as of 2020. In October 2021, India retained its third rank on the EY Renewable Energy Country Attractive Index [41].

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

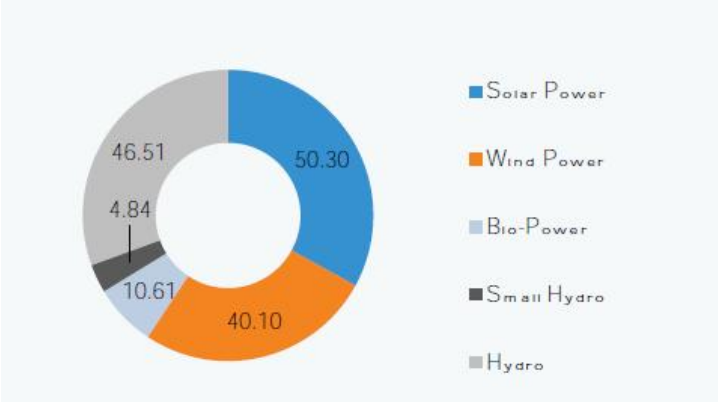
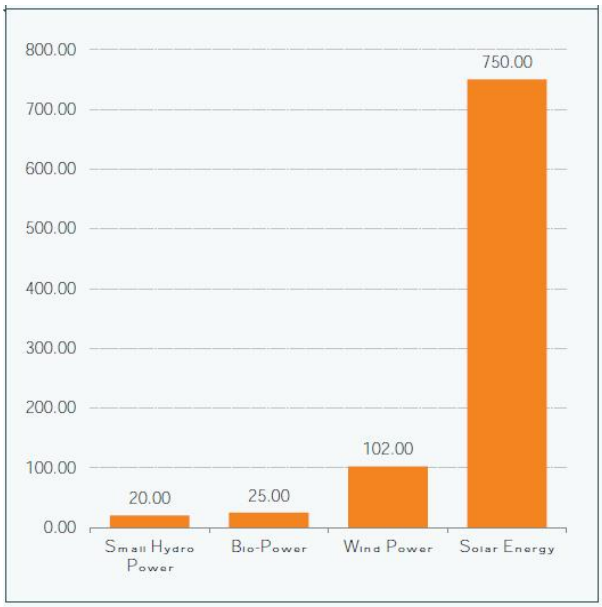


Fig. 5. Solar installed capacity breakup (GW)-January 22[41]

If we look the Fig.5 solar renewable energy itself contributing half of the total renewable energy installations, its shows that solar energy has bright future ahead.

Investments in the renewable energy sector stood at Rs. 45,000 crore (US$ 5.99 billion) in FY21 and Rs. 46,000 crore (US$ 6.13 billion) in FY22 (until July 2021). In 2022, India's renewable energy sector is expected to boom with a likely investment of US$ 15 billion this year, as the government focuses on electric vehicles, green hydrogen, and manufacturing of solar equipment. In April 2021, the Ministry of Power (MoP) released a draft of the National Electricity Policy (NEP) 2021 and has invited suggestions from all stakeholders such as Central Public Sector Undertakings, Solar Energy Corporation of India, power transmission companies, financial institutions such as the Reserve Bank of India, Indian Renewable Energy Development Agency, HDFC Bank, ICICI Bank, industrial, solar and wind associations and state governments [41].

Merger and acquisition are taking place to increase the renewable installation capacity October 2021, Reliance New Energy Solar Ltd. (RNESL) announced two acquisitions to build more capabilities. In October 2021, Adani Green Energy Ltd. (AGEL) acquired SB Energy India for US$ 3.5 billion to strengthen its position in the renewable energy sector in India. In August 2021, Renew Power merged with Nasdaq-listed special purpose acquisition company (SPAC) RMG Acquisition Corp. II (RMG II), which pegged the enterprise value of the new enterprise at US$ 8 billion [41].



a)

b)

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

Fig. 6. a) Renewable Energy Potential in India [41] b) RES as percentage of total installed capacity [41]

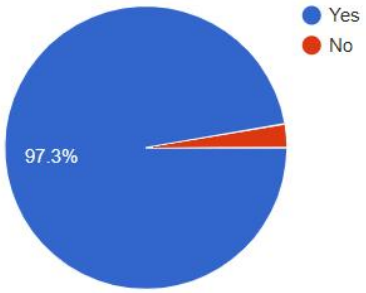
According to the latest report in IBEF (India Brand Equity Foundations) India is estimated to have renewable energy potential of 900 GW from commercially exploitable sources - Solar energy itself contributing to: 750 GW; Wind power1: 102 GW; Bio-energy: 25 GW; and Small Hydro: 20 GW as seen in the Fig.6 a.

Over the last few years there has been an increase in percentage contribution of renewable energy to total installed capacity. In 2013-14, the contribution was 12.92%, which increased to 38.56% as of January 2022. As seen in the Fig.6 according to the analytics firm British Business Energy, India ranked 3rd globally in terms of its renewable energy investments and plans in 2020. In June 2021, IKEA announced to launch programmes to help suppliers in India transit to 100% renewable power. The company has ~50suppliers in the country.

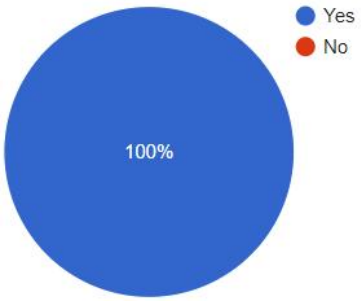
Challenges faced by the Solar Renewable Industry

The response on questionnaires from 50 peoples as follows:

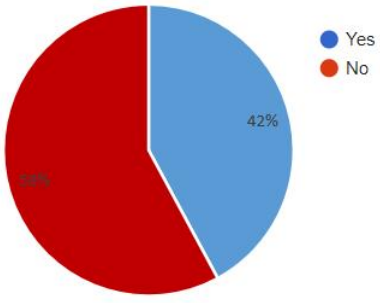
Questions 1 Are you aware about the use of the solar energy for electricity generation at home?



Questions 2. Do you believe solar energy is reliable source of energy?

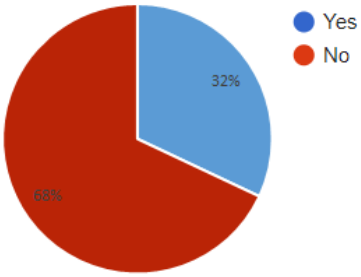


Questions 3. Are you aware about the current government solar policy for residential sector?

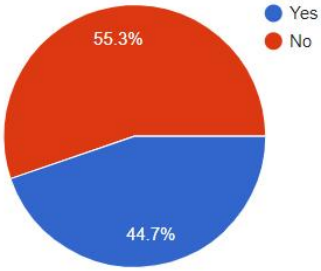


Questions 4. Are you aware about the current government solar subsidy for residential sector?

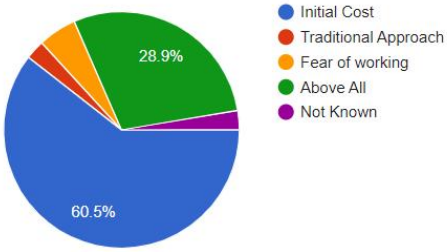
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252



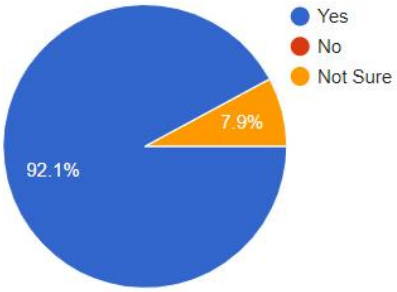
Questions 5. Are you aware about the financial scheme offer by various bank for solar installations?



Questions 6. What is the main factor do you feel affect the solar power plant installations?



Question 7 If set-up costs/maintenance were not a factor, would you consider using renewable energy or all of your energy needs?



Based on the analysis of selected publications and primary data collections we have analysed the various major challenges face by the solar industry as shown in the Fig.7.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

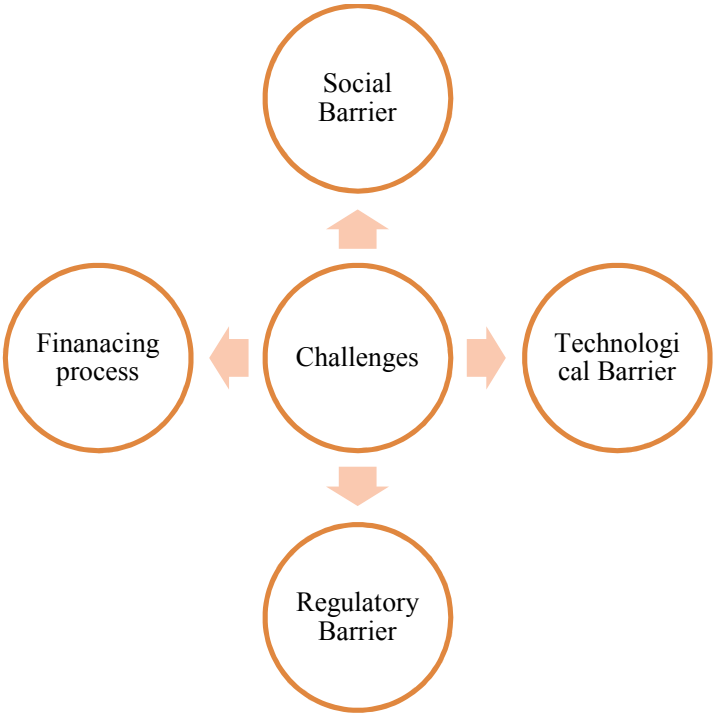


Fig. 7. Challenges faced by Solar renewable energy

Although PV technology has advanced tremendously, many of the selected publications show that there are still several barriers to adoption.

Social Barrier

The people are aware and feel solar is reliable source of energy in the above question 1 and 2 shows the lots of people are aware and feel solar is reliable source of energy still having fear in mind going green, the perspective towards; what is solar energy, how its work, what are benefits, which model is suitable is not yet clear. General information and awareness in relation to new technologies and understanding the practical problems in implementing and maintaining solar projects are limited [22]. The main concerns with respect to public understanding are: insufficient information regarding ecological and financial benefits, inadequate awareness of renewable energy technologies and uncertainties about the financial feasibility of RE installation projects [23]. The perception of adopters has a large impact on their decision whether to adopt a new technology or not. This is because the way that adopters perceive the complexity of technology can impact their decision on adoption [24]. There is always the fear of emanating from of yields due to environment changes and non-working of the system [26].

Financial Process

As seen in question 4 and 5 more than 50% of the people are not aware about the government subsidies and loan facility from various bank. The market for in India can be classified into four segments: Government market: where the government buys the output of the projects as a consumer, often providing budgetary support second is Government driven market: where the government pursues the use of RE in establishments outside its control for social reasons, often providing budgetary support or fiscal incentives for the same. For example, the government promotes the use of solar applications in schools, malls and hospitals Third is Loan market: where people take loans to finance RE based applications since self-financing is limited and forth is Cash market: where High Net worth Individuals can buy RE based applications for meeting personal energy needs India is currently at an initial stage of the first two segments. The Government of India is not focusing on promoting the third and fourth categories of RE, which may offer high potential for renewable energy-based applications [22].

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

Regulatory Barrier

Question 3 shows that more than 55% of the people are not aware about the solar policies. Over the years, the Government of India through the Ministry of New and Renewable Energy (MNRE) and Ministry of Finance (MoF), and the State Governments have used a number of policy instruments towards promotion of RE. Regulatory measures have mainly taken two forms: Renewable Purchase Obligation (RPO) and Feed-in Tariffs [22]. the policies are applicable for just 5 years, and the generated risk for investments in this sector is apparent. Policies instituted by the government have not supported the profitable exploitation of renewable energy resources for any intending investors. High supports in the form of subsidies are given to encourage energy generation from conventional energy sources leading to a fall in their prices and thereby creating an unfair competitive environment for solar energy exploitation; this has led to a slow in the growth demand for solar energy devices [25].

Management Barrier

Question 6 shows that people feel the initial cost of the system is too high, Question 7 shows if the installations and maintenance cost if reduce more peoples are willing to go solar.

Insufficient and inappropriate management is one of the main barriers in the diffusion of new technology. When a PV system is utilized to supply electricity access in rural areas in low-income economies, different business strategies should be implemented compared with the high-income economies where it is often used as an alternative power supply. In addition, implementing similar business models as for urban usage is not applicable in rural settings because of several conditions that differentiate this market from the higher income adopters [24].

Steps to overcome the barrier to solar energy development

Creating awareness

The large-scale implementation is possible only when society is aware about the advantage of going green and this can be achieved with continuous awareness. Tools can be used such as radio, seminars, advertisement and personal meetings with builders and associates [27],[29].

Consumer friendly government policies

Favourable policies are fundamental to long-term sustainability of solar energy development [29]. The MNRE should provide a comprehensive action plan or policy for the promotion of the renewable sector in its regulatory framework for renewables energy. The action plan can be prepared in consultation with SERCs of the country within a fixed timeframe and execution of the policy/action plan [30].

Providing various financial options of payment

The government should provide enough budget for the clean energy sector. The government should concentrate on R&D. Banks should allow an interest rebate on housing loans if the owner is installing renewable applications such as solar lights, solar water heaters, and PV panels in his house. Banks should provide the loans at lower rate of interest [30].

Innovative approach to target the consumer

Companies should use the strategies and business model to attract the customers as well make them aware about the renewable energy, this can be achieved with giving discounts, providing the free solar related product after installing the system or provide some percentage on the reference and taking feedback of the install system on regular basis. While targeting the urban, rural area and the low, middle and high-level economies different strategies and business models are required to be used [28].

Employment opportunities in solar renewable energy in India

The jobs in renewables are categorized into technological development, installation/de-installation, operation, and maintenance. The majority of employment in the renewable sector is contract based, and that employees do not benefit from permanent jobs or security, most poor citizens encounter obstacles to entry-level training and the employment market due

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

to lack of awareness about the jobs and the requirements. Few renewable programs incorporate developing ownership opportunities for the citizens and the incorporation of women in the sector.

The increasing investments in the renewable energy sector have the potential to provide more jobs than any other fossil fuel industry. A range of skilled and unskilled jobs are included in all renewable energy technologies, even though most of the positions in the renewable energy industry demand a skilled workforce. The renewable sector employs semi-skilled and unskilled labor in the construction, operations, and maintenance after proper training. Unskilled labor is employed as truck drivers, guards, cleaning, and maintenance. Semi-skilled labor is used to take regular readings from displays. A lack of consistent data on the potential employment impact of renewables expansion makes it particularly hard to assess the quantity of skilled, semi-skilled, and unskilled personnel that might be needed [39].

According to the independent study 'India's Expanding Clean Energy Workforce' released by the Council on Energy, Environment and Water (CEEW), Natural Resources Defense Council (NRDC) and Skill Council for Green Jobs (SCGJ), most of the new jobs would be generated by small-scale renewable energy projects such as rooftop solar and mini and micro-grid systems, compared to utility or large-scale projects like solar parks [38].If we overlook the global solar renewable energy employment from 2012 to 2017 jobs has increased exponentially as shown in the Table 1.

Sources (Million Jobs)	2012	2013	2014	2015	2016	2017
Solar photovoltaic	1.36	2.27	2.5	2.77	3.09	3.37
Bioenergy (biofuel, solid biomass, biogas)	2.4	2.5	2.99	2.88	2.74	3.06
Wind energy	0.75	0.83	1.03	1.08	1.16	1.15
Solar heating/Cooling	0.89	0.5	0.76	0.94	0.83	0.81
Others (Geothermal, SHP, CSP, heat pumps, WTE, Ocean)	0.33	0.38	0.4	0.4	0.45	0.45
Total (Million)	5.73	6.48	7.68	8.07	8.27	8.84

Table. 1. Global renewable energy employment for the corresponding technologies in 2012–2017[39]

As in past years, China maintained the most notable number of people employed (3880 million jobs) estimating for 43% of the globe's total which is shown in Fig. 8. In India, new solar installations touched a record of 9.6 GW in 2017, efficiently increasing the total installed capacity. The employment in solar PV improved by 36% and reached 164,400 jobs, of which 92,400 represented on-grid use. IRENA determines that the building and installation covered 46% of these jobs, with operations and maintenance (O&M) representing 35% and 19%, individually. India does not produce solar PV because it could be imported from China, which is inexpensive. If India starts the manufacturing base, more citizens will get jobs in the manufacturing field. India had the world's fifth most significant additions of 4.1 GW to wind capacity in 2017 and the fourth largest cumulative capacity in 2018. IRENA predicts that jobs in the wind sector stood at 60,500[39].

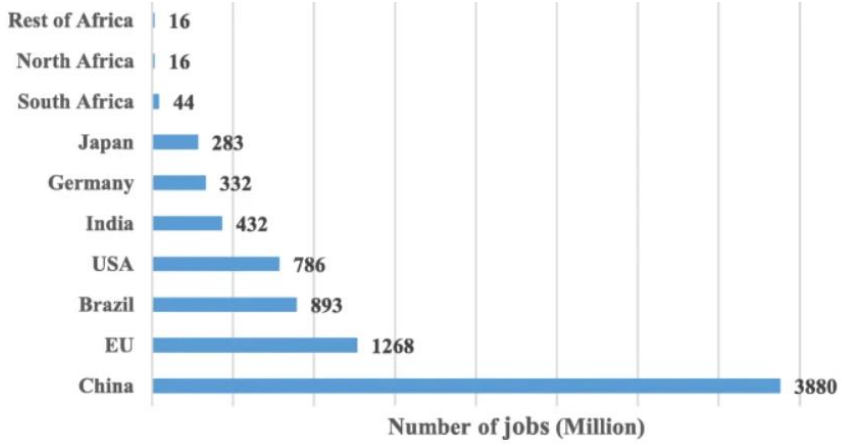


Fig.8. Renewable energy employment in selected countries [39]

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

According to a new and updated NRDC, CEEW and SCGJ report, "India's Expanding Clean Energy Workforce: Opportunities in The Solar and Wind Energy Sectors," expanding clean energy has huge employment and economic potential: reaching its goal of 500 GW of non-fossil fuel energy sources by 2030, India can create 3.4 million new clean energy jobs providing employment to over a million people. A large chunk of these jobs will likely be generated through distributed renewable energy that creates local employment opportunities and brings transition closer to communities [40].

V. CONCLUSION AND DISCUSSION

Solar renewable energy has the bright future in India and solar renewable energy is becoming widely used alternative source for conventional energy and help in social and economic development of the country. Still there are several challenges in adoption of the solar energy but we can try to minimize these challenges so perspective of society towards going green will change, the information technology will play the important role in this.

The study shows that as economic point of view the cost of the system is still generally perceived as high. Apart from this there are several barriers in adopting the solar energy in the society like government policies, financing process, weak management, fear towards adopting new technology and high initial investment cost. There is a delay in the authorization of private sector projects because of a lack of clear policies. We can try to minimize this limiting factors. Spreading the awareness and healthy consumer perspective government policies and different financial models helps to minimize barrier. The government should allow more funds to support research and innovation activities in solar renewable sector. The renewable energy market requires explicit policies and legal procedures to enhance the attention of investors.

India has the huge future employment potential India can create about 3.4 million jobs short and long term. Developing and offering training programs for citizens with minimal education and training, who do not fit current programs, will helps to create the employment. Poverty impact assessments might be embedded in program design to know how programs motivate poverty reduction, whether and how they influence the community. Providing people ownership in renewable projects is also important because this could contribute to the growth of the sector.

Various reports show that from last few years the solar installation has increased which states that the solar energy has the vast potential as compared to the other renewable sources available in India. Solar energy not only contributes towards the environmental impacts but also helps in social and economic development of the country.

REFERENCES

[1] Carson Schwalbach University of Nebraska Lincoln 2016 How Renewable Energy Benefits Businesses and the Environment https://digitalcommons.unl.edu/envstudtheses/191

[2] Gautam Raina and Sunanda Sinha Outlook on the Indian scenario of solar energy strategies: Policies and challenges doi.org/10.1016/j.esr.2019.04.005

[3] Article IBEF Indian Renewable Energy Industry Report https://www.ibef.org/industry/renewable-energy

[4] Martin Jens Energy Efficiency and Sustainability the human journey https://humanjourney.us/energy-efficiency/?gclid=CjwKCAjwjZmTBhB4EiwAynRmD8YH7_lV3ZboEe5-sz1nltRniwRCjIuKyNnrJns-Pv0Wn1uHOhmEWBoCMxgQAvD_BwE

[5] Clean Energy Group and Smart Power August 2009 Smart Solar Marketing Strategies cleanegroup.org/wp-content/uploads/Smart-Solar-Marketing-Strategies.pdf

[6] Coita Dorin Cristian University din Oradea A MARKETING STRATEGY ON PHOTOVOLTAIC MARKET https://www.researchgate.net/publication/46533354_A_MARKETING_STRATEGY_ON_PHOTOVOLTAIC_MARKET/link/0f316da33829de2215fb7ed7/download

[7] Article Web FX 5 Proven Strategies for Solar Marketing https://www.webfx.com/industries/home-repair/solar/

[8] Article 3Degrees_4PsCommSolar_WhitePaper_Aug201The four Ps of Community Solar https://3degreesinc.com/wp-content/uploads/2016/02/3Degrees_4PsCommSolar_WhitePaper_Aug2015.pdf

[9] Article EPRI December 2015 Budgeting for Solar PV Plant Operations & Maintenance: Practices and Pricing https://www.osti.gov/servlets/purl/1234935

[10] Article Solar Energy Company Pvt. Ltd Solar business plan https://www.academia.edu/23182184/Solar_business_plan

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

[11] Kalpana Ambepitiya Research Gate December 2015 Strategies to Promote Solar Power Energy: A Review of Literature https://www.researchgate.net/profile/Kalpana-Ambepitiya
[12] Vardhan V, P. Raja, Kabirdoss Devi International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8, Issue-11S, September 2019 social media as the Next Trend in Social Business Marketing social media as the Next Trend in Solar Business Marketing https://www.ijitee.org/wp-content/uploads/papers/v8i11S/K113309811S19.pdf
[13] Rasa Smaliukienė Research Gate March 2019 a Step-by-step approach to social marketing in energy transition https://www.researchgate.net/profile/Rasa-Smaliukiene
[14] Tahereh Zobeidi International Institute for applied system analysis October 2020 impact of social media on Perceptions and Use of Renewable Energy Sources http://pure.iiasa.ac.at/id/eprint/17056/1/YSSP%20report%20Tahere%20Zobeidi.pdf
[15] Mayowa Ezekiel Akeju Walden University 2021 Profitability Strategies of Solar Energy Businesses in Lagos, Nigeria https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=11900&context=dissertations
[16] Paper IRENA November 2019 Future of Solar Photovoltaic Deployment, investment, technology, grid integration and socio-economic aspects https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Nov/IRENA_Future_of_Solar_PV_2019.pdf
[17] FICCI Subgroup on Securing Solar Supply Chain FICCI Solar Energy Task Force Report on Securing the Supply Chain for Solar in India https://ficci.in/spdocument/20294/Supply-Chain-paper.pdf
[18] Paper Irena Energy As A Service Innovation Landscape Brief https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA_Energy-as-a-Service_2020.pdf
[19] Paper NREL Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems; 3rd Edition https://www.nrel.gov/docs/fy19osti/73822.pdf
[20] Prasanth Regy, Rakesh Sarwal, Clay Stranger, Garrett Fitzgerald, Jagabanta Ningthoujam, Arjun Gupta, Nuvodita Singh. 2021 ISBN: 978-81-949510-3-2 Turning around the power distribution sector https://www.niti.gov.in/sites/default/files /2021-08/Electricity-Distribution-Report_030821.pdf
[21] Article Fraser Sherman Updated April 19, 2022 Diversification and its importance https://smallbusiness.chron.com/diversification-its-importance-77562.html
[22] A Discussion Paper February 2010 INFRASTRUCTURE DEVELOPMENT FINANCE COMPANY LTD. Barriers to development of renewable energy in India & proposed recommendations https://www.idfc.com/pdf/publications/Discussion-paper-on-Renewable-Energy.pdf
[23] Seetharaman, Krishna Moorthy, Nitin Patwa, Saravanan, Yash Gupta Elsevier Breaking barriers in deployment of renewable energy https://www.sciencedirect.com/science/article/pii/S2405844018354240
[24] Emrah Karakaya and Pranpreya Sriwannawit April 2015 Elsevier Barriers to the adoption of photovoltaic systems: The state of the art https://doi.org/10.1016/j.heliyon.2019.e01166
[25] Rajvikram Madurai Elavarasan, Leoponraj Selvamanohar Kannadasan Raju, Raghavendra Rajan Vijayaraghavan, Ramkumar Subburaj, Mohammad Nurunnabi, Irfan Ahmad Khan, Syed Afridi's, Akshaya Hariharan, Rishi Pugazhendhi MDPI August 2020 a Holistic Review of the Present and Future Drivers of the Renewable www.mdpi.com /journal/sustainability
[26] Shuaib Kamili, under the guidance of Ashish Kulkarni and Yuvaraj Dinesh Babu Nithyanandam. January 2020 Identifying barriers for rooftop solar uptake in MSMEs and development of a mitigating financial framework https://solarrooftop.gov.in/knowledge/file-62.pdf
[27] Vivek Khambalkar, Sandip Nage Research Gate July 2010 Renewable energy: An assessment of public awareness https://www.researchgate.net/publication/215524573
[28] Ramiar Sadegh-Vaziri KTH Industrial Engineering and management 2013 Entrepreneurship and Innovation in Energy and Environmental Technologies; Barriers and Opportunities https://www.diva-portal.org/smash/get/diva2:629572/FULLTEXT01.pdf
[29] Olayinka S. Ohunakin, Muyiwa S. Adaramola, Olanrewaju. M. Oyewola, Richard O. Fagbenle ELSEVIER January 2014 Solar energy applications and development in Nigeria: Drivers and barriers www.elsevier.com/locate/rser

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 6, May 2022
Impact Factor: 6.252

[30] Charles Rajesh Kumar, Energy, Sustainability and Society volume 10 January 2020 Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0232-1
[31] Article Amplify XL October 2021 Solar Inventory https://amplifyxl.com/solar-inventory/
[32] Article NREL February 2021 Documenting a Decade of Cost Declines for PV Systems https://www.nrel.gov/news/program/2021/documenting-a-decade-of-cost-declines-for-pv-systems.html
[33] Arjun Dutt, Pablo Gonzalez, Nikhil Sharma, Lucila Arboleya, and Ruchita Shah Report December 2021 ceew.in Clean Energy Investment Trends 2021
[34] India Exim Bank (January 2022). "Indian Solar Sector - Fostering Growth and Sustainable Development (Refer to Table 13)". Retrieved 13 February 2022. https://energy.economictimes.indiatimes.com/etanalytics/reports/renewable/indian-solar-sector-fostering-growth-and-sustainable-development/847
[35] Tayal, Manu (27 May 2020). "MNRE Invites Proposals to Develop Institutional Framework for 'One Sun One World One Grid' Implementation". Saur Energy. Retrieved 31 May 2020. https://www.saurenergy.com/solar-energy-news/mnre-invites-proposals-to-develop-institutional-framework-for-one-sun-one-world-one-grid-implementation
[36] "India Set To Propose World Solar Bank & Mobilize $50 Billion In Solar Funding". Clean Technica. 26 July 2020. Retrieved 27 July 2020. https://cleantechnica.com/2020/07/26/india-set-to-propose-world-solar-bank-mobilize-50-billion-in-solar-funding/
[37] Neslen, Arthur (4 December 2015). "India Unveils Global Solar Alliance of 120 Countries at Paris Climate Summit". AlterNet. Retrieved 6 August 2016.
[38]Article-India's renewable energy sector to employ one million people by 2030: Study https://timesofindia.indiatimes.com/city/nagpur/indias-renewable-energy-sector-to-employ-one-million-people-by-2030-study/articleshow/89166223.cms
39] Charles Rajesh Kumar. J,M. A. Majid Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0232-1
[40] Sameer Kwatra & Charlotte Steiner Article January 2022 India Could Create Millions of Jobs Through Renewable Energy https://www.nrdc.org/experts/sameer-kwatra/india-could-create-millions-jobs-through-renewable-energy
[41] Report IBEF Renewable Energy https://www.ibef.org/industry/renewable-energy