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Study of the Future Perspective of Indian Consumers Regarding the Green Energy Market and Products

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ABSTRACT

Renewable energy sources and technologies have potential to provide solutions to the longstanding energy problems being faced by the developing countries like India. Solar energy can be an important part of India's plan not only to add new capacity but also to increase energy security, address environmental concerns, and lead the massive market for renewable energy. Solar thermal electricity (STE) also known as concentrating solar power (CSP) are emerging renewable energy technologies and can be developed as future potential option for electricity generation in India.

In this paper, efforts have been made to summarize the availability, current status, strategies, perspectives, promotion policies, major achievements and future potential of green energy options in India.

Keywords: Renewable energy, green power, sustainable marketing.

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Introduction

The Indian renewable energy sector is the second most attractive renewable energy market in the world. The country ranks fourth in the world in terms of total installed wind power capacity. India added 11.788 GW of power generation capacity from renewable sources between January – November 2017. Under reform-minded Prime Minister Narendra Modi, India set new goals for Renewable energy that go above and beyond its own manufacturing capacity. This has stimulated investment in the sector and promoted increased deployment across a range of Technologies, particularly solar energy. U.S. exporters like Tesla, however, have found the Indian market frustrating, and are often perplexed by bureaucratic obstacles, Infrastructure weakness and continuing emphasis on local content in certain projects. The focus of Government of India has shifted to clean energy after it ratified the Paris Agreement. With the expanded help of government and improved financial aspects, the part has turned out to be alluring from speculators point of view and India positioned second in Sustainable power source Appealing List 2017. As India hopes to fulfill its vitality need without anyone else, which is required to achieve 15,820 TWh by 2040, sustainable power source is set to assume an essential job. The Indian sustainable power source area is the second most appealing sustainable power source advertise on the planet according to the Sustainable power source Allure File 2017. India's installed renewable power generation capacity (including hydropower) increased at a Compound Annual Growth Rate (CAGR) of 8.39 per cent from 42.4 Giga-watts (GW) in FY2006-07 to 105.12 GW in FY18 (as of December 2017), which is 31.77 per cent of the total installed capacity. India has the fourth largest installed capacity of wind power and the third largest installed capacity of concentrated solar power (CSP). The Ministry of New and Renewable Energy, Government of India, has formulated an action plan to achieve a total capacity of 60 GW from hydro power and 175 GW from other RES by March, 2022, which includes 100 GW of Solar power, 60 GW from wind power, 10 GW from biomass power and 5 GW from small hydro power. This has been proving to be the major thrust for the sector in India as the market players have sufficient incentives to move to clean source. As India looks to meet its energy demand on its own, which is expected to reach 15,820 TWh by 2040, renewable energy is set to play an important role. By 2030, renewable sources are expected to help meet 40 per cent of India's power needs. The non-conventional energy sector has received a total FDI equity inflow of US\$ 6.01 billion during April 2000 to September 2017.

Literature Review

For more than two decades, the reform of the European Union policy in the energy sector has been marked by two mainstream objectives – the liberalization of the energy market, as means to create an integrated (single) market, and the promotion and use of renewable energy. Pursuant to the Sector Inquiry of 2007, the regulatory framework was determined to encompass three main policy objectives, namely “achievement of efficient and competitive integrated energy sector, maintaining adequate level of security of supply and increasing the effectiveness of environmental protection”. In order to address these issues, the European Union adopted the Third Energy Package, which stressed on the impediments at which competition was exposed, to name a few high levels of concentration on the national markets, insufficient

network capacity, non-transparent and discriminative network access conditions, as well as cross-border trade related shortcomings. In addition, with respect to the increasing environmental concerns and the realized necessity to enhance the promotion of renewable energy, the new Directive 2009/28/EC4 was adopted. With it, emphasis was placed on priority and/or guaranteed network access, cross-border support of energy from renewable sources and high barriers to entry. Moreover, under recital 26 of the Directive, the concept of internalization of the external costs was introduced. This concept advocates for recognizing the external values attributed to the renewable energy, namely lower CO2 emissions and environmentally friendly production, as opposed to the negative externalities, related to fossil fuel generation. In line with the ambitious targets, set by the European Union under the 2020 strategy6 and later under the 2050 energy strategy,7 the relevant legislation aimed to address and facilitate the increasing importance of renewable energy on the market for generation and supply within the Community. In other words, this legislative endeavor was subject to creating favorable conditions for the development of market for renewable energy.8The “emerging consumer market for electricity from renewable energy sources”, however, gives rise to a number of questions. First, regardless of the common understanding that electricity is a homogenous product, which cannot be distinguished based on its source of generation, can it be inferred that there are sufficient grounds to consider a distinct market for renewable energy? So far, the Commission has not recognized the existence of separate narrow market for this specific product and the market definition is drawn in a persistent and conservative manner.

The following is a summary of some of the information contained in the IEA (2017) report.

Fuel Type	1973	2005
Fossil fuels oil, coal and gas	86.6%	81%
Combustible Renewables & Waste, Nuclear, Hydro and Other (geothermal, solar, wind, heat etc.)	13.4%	19%

Figure 1 Source: IEA 2017 Report

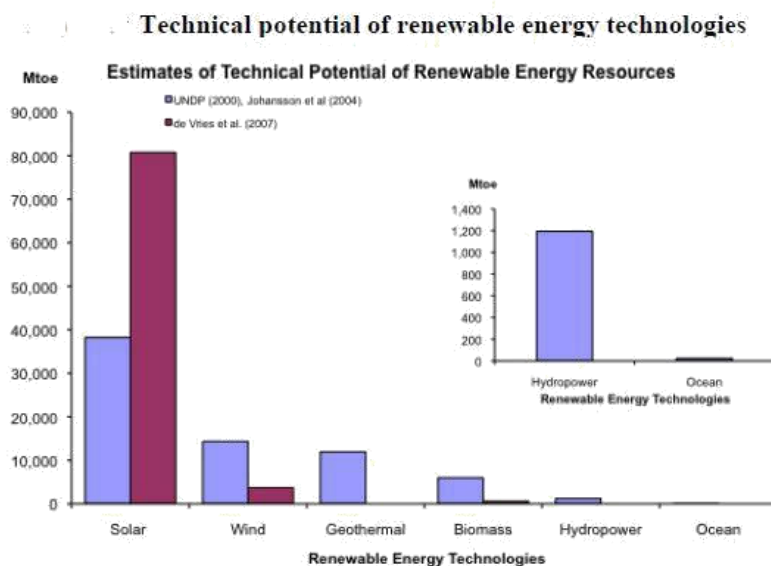


Figure 2 Source: UNDP (2000), Johansson et al. (2004) and de Vries et al (2017)

Solar energy has experienced phenomenal growth in recent years due to both technological improvements resulting in cost reductions and government policies supportive of renewable energy development and utilization. While the cost of solar energy has declined rapidly in the recent past, it still remains much higher than the cost of conventional energy technologies. Like other renewable energy technologies, solar energy benefits from fiscal and regulatory incentives and mandates, including tax credits and exemptions, feed-in-tariff, preferential interest rates, renewable portfolio standards and voluntary green power programs in many countries.

Market Overview and Trends in India

India accounts for approximately 4 per cent of the total global electricity generation and contributes 4.43 per cent to the global renewable generation capacity. The International Energy Agency's World Energy Outlook projects a growth of renewable energy supply to 4,550 GW in 2040 on a global basis. As of December 2017, total renewable power generation installed capacity in the country stood at 105.12 GW, which is 31.77 per cent of the total installed capacity. A hydro power revival policy is underway which amongst others is likely to include the classification of all hydro power projects as renewable energy. Installed renewable power generation capacity has increased steadily over the years, posting a CAGR of 8.39 per cent in FY07–17. India has the fourth largest installed capacity of wind power and the third largest installed capacity of concentrated solar power (CSP). The Government of India has formulated an action plan to achieve a total capacity of 60 GW from hydro power and 175 GW from other RES (excluding large hydro projects) by March, 2022, which includes 100 GW of Solar power, 60 GW from wind power, 10 GW from biomass power and 5 GW from small hydro power. Solar installation in India is expected to increase 360 per cent by 2020. India witnessed highest ever solar power capacity addition of 5,525.98 MW and 467.11 MW of wind power capacity addition in 2017-18. 15,000 biogas plants were installed during the same time period. About 4.96 million household size biogas plants have been installed in India since the inception of National Biogas and Manure Management Programme (NBMMP). Among the different sources of renewable power in India, the CAGR in installed capacity over FY07–FY17 was 2.32 per cent for hydro power, 20.12 per cent for other renewable energy sources, supported by the commencement of solar capacity addition since 2012. The Government of India is projecting a rapid 17.04 per cent CAGR increase in other RES installed capacity to 275 GW by 2027 supported by a surge in solar power capacity addition. Off-grid power equivalent to 168.87 MW was added in the country during January – November 2017. Growth in solar power installed capacity is expected to surpass the installed capacity of wind power, reaching 100 GW by 2022 from its current levels of 14.8 GW as of December 2017. Three new solar parks have been approved in 2017-18 with a total capacity of 1,523 MW. Rapidly falling costs has made Solar PV the largest market for new investment. Further, the scaling up of the target of National Solar Mission to 100 GW from 20 GW of grid connected solar power by 2022, creates a positive environment for investors keen to tap into India's renewable energy potential. In November 2017, Government of India signed a US\$ 100 million agreement with the World Bank for 'Shared Infrastructure for Solar Parks Project'. As of November 2017, Government of India is also planning 'Rent a Roof' policy to push adoption of solar energy while

giving the households a chance to become energy independent. Due to its favorable location in the solar belt (400 S to 400 N), India is one of the best recipients of solar energy with relatively abundant availability. India has a vast potential for solar power generation with about 58 per cent of the total land area (1.89 million km²) receiving above 5 kWh/m²/day annual average global insolation. This coupled with its highest global warming mitigation potential makes it a viable alternative for power generation among the available clean energy sources.

Research Methodology

To study the future perspective of Indian consumers regarding the renewable energy market and products such as Electric Cars, Solar Lights and Solar Roofs etc.

Research objectives

- ✓ To understand what Renewable (Green) Energy Sector actually is.
- ✓ To understand the different types of technology under green-energy Sector in India
- ✓ To find out the potential of green energy and related products and services in India.
- ✓ To find the role of Renewable Energy resources in reducing the impact of pollution.
- ✓ To judge the perception of consumers who are aware and use Energy Products and Services.
- ✓ To know about the consumer's preferences regarding green energy-products.
- ✓ To find out the impact on countries and on their economy by using Renewable Sources of Energy.
- ✓ To develop insights regarding the perception of consumers and nature of consumers towards green energy and related products in India.

The sole purpose of the study is to gain knowledge of the green energy sector in India. This study helps to guide the researchers about the Indian consumers' perception over the green energy and related products.

Research Design: To complete the survey for the study of Renewable Energy Sector Market and impact on the common people, a causal research design has been used. Causal effect occurs when variation in one phenomenon, an independent variable, leads to or results, on average, in variation in another phenomenon, the dependent variable.

Data sources: Primary Information: Primary information has been collected by the help of self-conducted survey in which questionnaire was used as a survey tool to collect information. **B. Secondary**

Information: Secondary information has been collected by the means of internet, social sites, articles, blogs, journals and research papers.

Research instrument

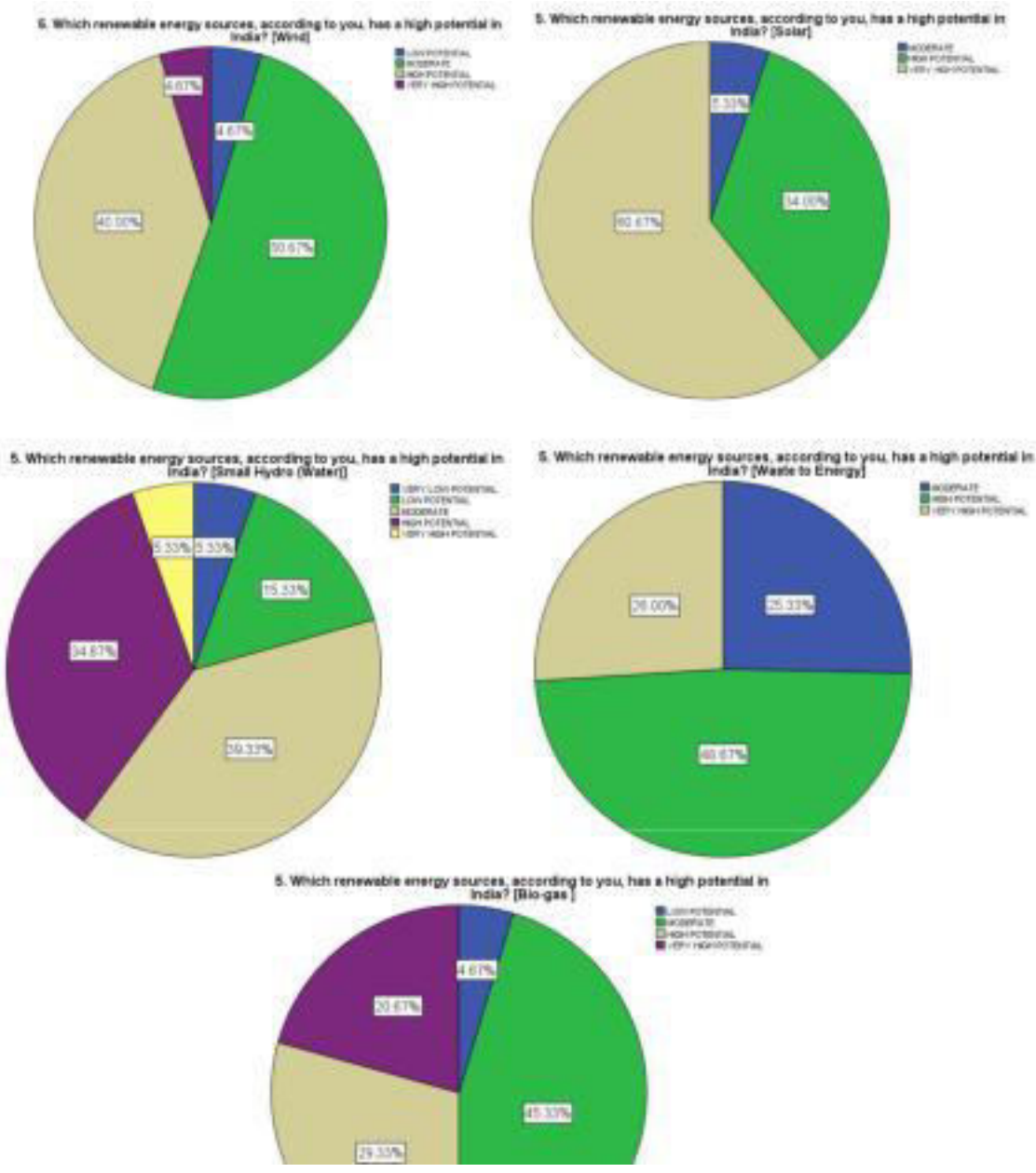
The research work for this project has been completed by using a questionnaire as a research tool.

Primary Data Collected Samples 150 Units. Secondary Data: Case study books and other research papers in the literature review papers are being monitored for further work

Analysis Tools Applied: Data analysis using software like SPSS, MS Excel, MS Power BI, Orange Inc.

Data Analysis & Interpretations

Awareness on the current status of renewable energy technologies in India

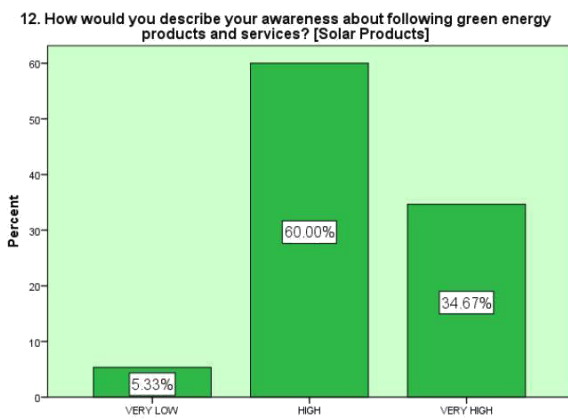


Interpretation:

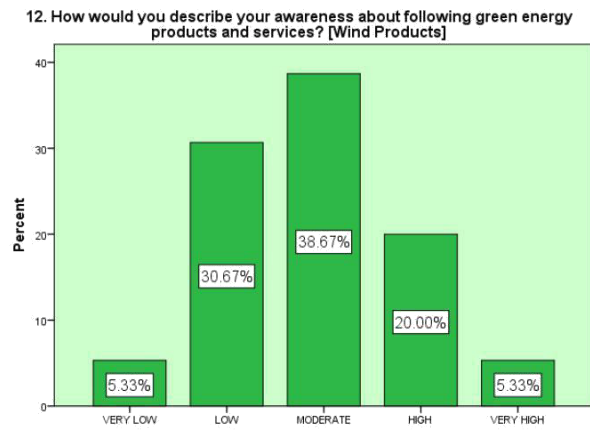
Out of the five most widely used sources – wind, solar, small hydro, biomass and waste-to-energy – solar energy got the highest response. More than 95% of the respondents are of the view that solar energy has a high potential in India. About 75% of the total respondents think that waste-to energy has a high potential, followed by biomass (~50% of the total), wind (~45% of the total) and small hydropower (~40% of the total).

Perception on whether prices of renewables will reduce to a considerable level

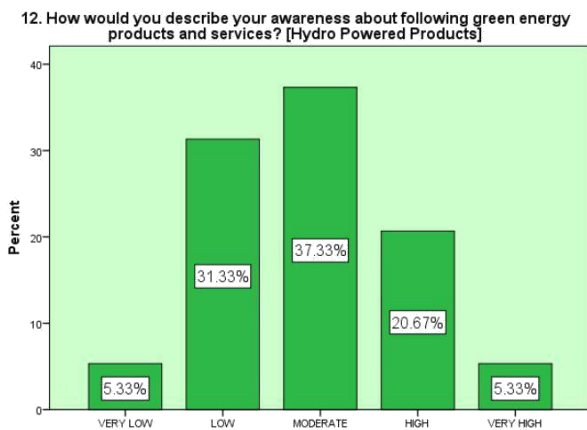
Awareness on renewable energy products and service



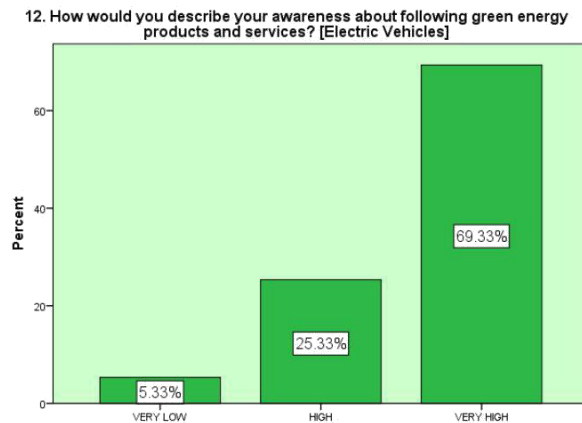
12. How would you describe your awareness about following green energy products and services? [Solar Products]



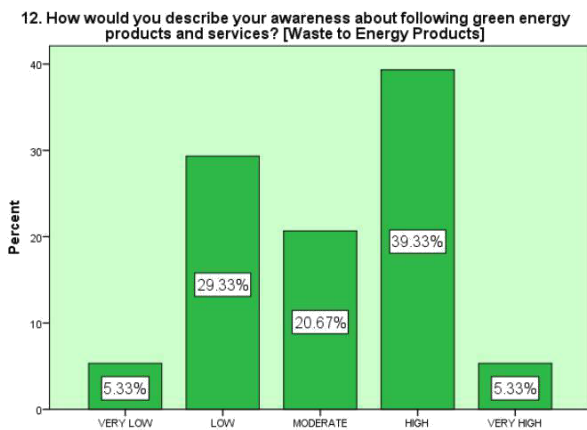
12. How would you describe your awareness about following green energy products and services? [Wind Products]



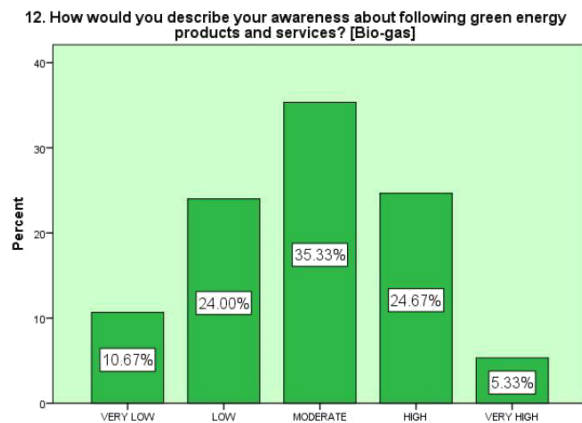
12. How would you describe your awareness about following green energy products and services? [Hydro Powered Products]



12. How would you describe your awareness about following green energy products and services? [Electric Vehicles]



12. How would you describe your awareness about following green energy products and services? [Waste to Energy Products]



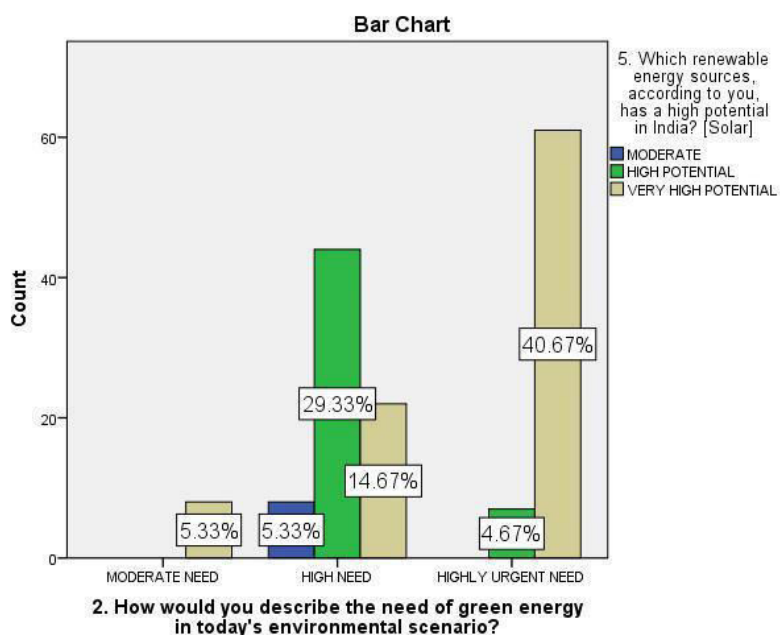
12. How would you describe your awareness about following green energy products and services? [Bio-gas]

Interpretation:

It is remarkable that almost 95% people are aware about solar products and electric vehicles in the market. Also, almost 25% people are aware about wind and hydro powered products in Indian market. Above this, it is shocking that almost 45% people know about waste to energy products. At last bio-gas products are not known by most of the respondent.

Correlation between today’s scenario and potential of RE Tech in India

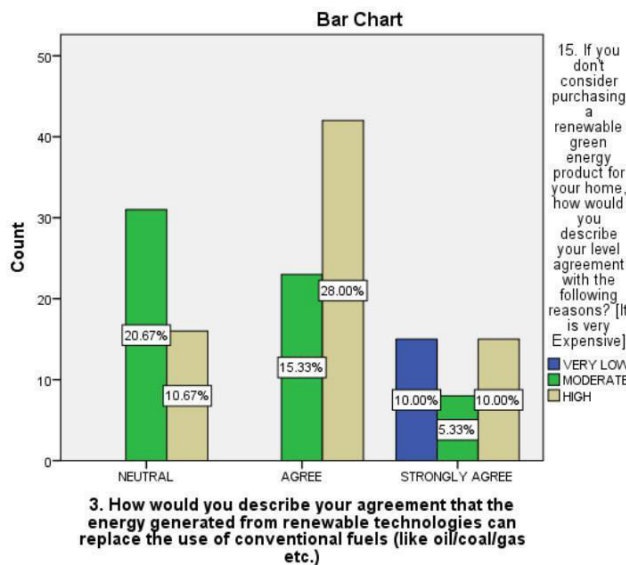
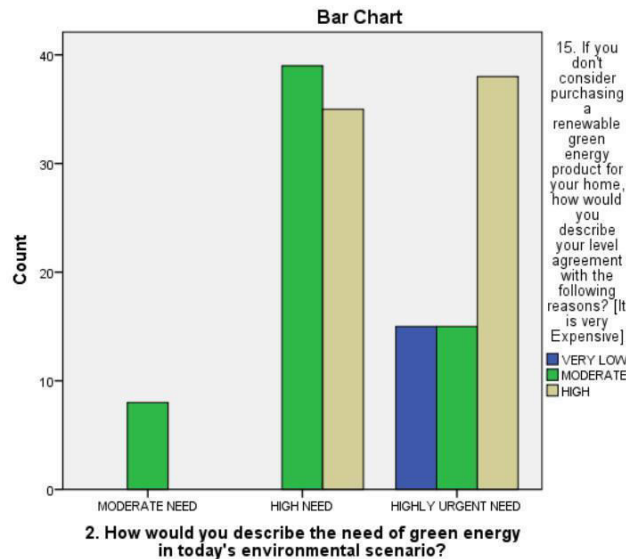
		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval	by Pearson's R	.377	.071	4.950	.000 ^c
Ordinal	by Spearman Correlation	.455	.072	6.217	.000 ^c
N of Valid Cases		150			



Interpretation:

45% people who think that there is highly urgent need of RE tech in India points out that solar tech has very high potential in country. Also, it co-vary with 37% factor.

Correlation between today’s scenario and reasons for non-adoption of RE Tech.



Correlation 2

Interpretation

Almost 50% people among the respondents feels that RE Tech in today’s scenario is very expensive. Amazingly, most of the people (almost 48%) who think that RE Tech is very expensive agree with the fact that RE Tech will become cheaper in future. Out of that 48%, about 38% strongly agree with this fact.

4.2 Secondary Data Analysis

Market Size

Total installed renewable energy capacity in India touched 62.846 GW as of December 2017, which is around 18.8 per cent of total energy capacity of the country (333.5 GW). During December 2017, total installed wind power capacity in the renewable mix* stood at 32.85 GW (52.27 per cent), while solar power capacity was 17.05 GW (27.13 per cent).

Total solar capacity in India is expected to be 8 per cent of global solar capacity by 2035. With a potential capacity of 363 Giga-watts (GW) and with policies focused on the renewable energy sector, Northern India is expected to become the hub for renewable energy in India.

Investments/ Developments

According to data released by the Department of Industrial Policy and Promotion (DIPP), FDI inflows in the Indian non-conventional energy sector between April 2000 and September 2017 stood at US\$ 6.01 billion. The Central Electricity Authority (CEA) expects investment in India's power transmission sector to reach Rs 2.6 trillion (US\$ 40.3 billion) during the 13th plan (2017-22), and to enhance the transmission capacity of the inter-regional links by 45,700 megawatt (MW). The Government of India and the Asian Development Bank (ADB) have signed a loan agreement for US\$ 175 million to be provided to Power Grid Corporation of India Limited (PGCIL) for construction of interstate transmission systems for solar power projects which will enable the transfer of surplus solar energy to power-deficit states.

Indian Market by International Trade Administration

India is already a major renewable energy market (with the sixth largest renewable energy capacity) despite fossil fuels still accounting for 75 percent of its energy mix. A new national government commitment to clean energy should facilitate growth over the next several years. According to ITA's projections, only two markets will install more renewable energy capacity through 2017 than India – China and Japan. In 2014, India elected Narendra Modi in a sweeping election that carried with it a broad mandate to improve India's power sector. Modi had a strong track record of developing renewable energy from his time as chief minister in Gujarat and he has continued to support clean energy development during his time as Prime Minister. This has been bolstered by India's participation in the COP21 negotiations, where it emphasized climate financing that would benefit the country's transition to renewable energy sources. The Modi administration's largest and most perplexing challenge is arguably India's significant need for power, especially in rural areas. Rolling brownouts have hampered economic growth and limited foreign investment in the country. The July 2012 blackout that affected 620 million people, for example, was seen as a global embarrassment and remains a politically contentious topic to this day. This has been combined with a growing realization of the need to reduce the country's emissions profile, which means India must address its dependence on heavy, coal-fired electricity generation. Encouraging energy efficiency upgrades for coal power plants, doubling the tax on coal power production, and pairing new coal power plants with solar

installations are among the ways India is tackling this long-term problem. Upon entering office, Modi reiterated his campaign pledge to ensure 24/7 power for all Indians. Given India's ongoing difficulties in thermal generation, new renewable energy investment will likely need to be relied on to meet this commitment. While significant development is expected in the wind and hydropower sectors, solar is expected to play the most important role in India's power mix among renewables going forward – both as a result of falling solar prices and Prime Minister Modi's history with the technology.

Major Findings

There are 74% male in the survey conducted within the circumference of Amity Business School.

Also 86% people lie between in age group of 18-25 years “the Young Gen”

The above statistic implies that individual awareness level in Amity Business School is moderate among 34.67% people out of total respondents. It is followed by high awareness among individuals in Amity Business School with 28% people out of total respondents. But it's shameful that almost 47% people are not so aware about green/renewable energy even in the current scenario. About 95% people think that green energy is future of the Indian consumer market. Also, they believe that RE products are the future of retail and IT sector in coming era where energy is everything people will require. It's amazing that 95% people out of total respondents agree that our society need green energy as alternative fuel on urgent basis. The survey questions to assess the awareness among Indian citizens about the potential of RE to replace use of fossil fuel show very positive response, with 75% highly agreeing to the proposition that RE will replace use of conventional fuel in the near future.

A remarkable 100% of the respondents gave their support to this aspect. This shows that people have a positive outlook towards RE adoption. It is remarkable that almost 95% people are aware about solar products and electric vehicles in the market. Also, almost 25% people are aware about wind and hydro powered products in Indian market. Above this, it is shocking that almost 45% people know about waste to energy products. At last bio-gas products are not known by most of the respondent. Nearly 57% of the respondents feel that central government, state governments, private businesses and individuals – all together – must take the lead action in RE adoption. Almost 15% of the respondents feel that central government must take lead to justify and signify the importance of RE and products in the general public. But 28% of significant respondents feel that private business can do it better in any way. A high share of the respondents, about 50% of the people, were of the opinion that ‘renewables are expensive’. 33% think that ‘RE will not be able to meet the complete energy need’. 16% said that they are not aware of such technologies.

A fair number of people, 30%, consider space as a constraint for RE adoption at the household level. Some respondents also feel that these technologies are not attractive (5% of the respondents), and few also admitted to not knowing how to operate them (0.89 per cent).

55 per cent of the total target audiences use some solar products and renewable energy appliance, while 45 per cent of them use other renewable energy product like calculators.

It is interesting that 5% people are using REVA in the market. About 95 per cent of people find renewable energy for environmental responsibility. More than 90 per cent of people believe that renewable energy shift can contribute to a greener lifestyle.

About 85 per cent of the respondents are not aware of appropriate platforms to access information on RE related initiatives and programmers. Further, nearly 80 per cent of the respondents think that they do not know about any outlet to purchase RE products. But, nearly 45% people want information through ads on TV and print media. Also, 40% people will be encouraged to buy RE products if vendor offer free maintenance.

Amazingly, Tesla is the most recognized brand in people followed by Sun-king.

45% people who think that there is highly urgent need of RE tech in India points out that solar tech has very high potential in country. Also, it co-vary with 37% factor.

Almost 50% people among the respondents feels that RE Tech in today's scenario is very expensive. Amazingly, most of the people (almost 48%) who think that RE Tech is very expensive agree with the fact that RE Tech will become cheaper in future. Out of that 48%, about 38% strongly agree with this fact.

Conclusion:

India has a severe electricity shortage. It needs massive additions in capacity to meet the demand of its rapidly growing economy. Development of solar energy, which is indigenous and distributed and has low marginal cost of generation, can increase energy security by diversifying supply, reducing import dependence, and mitigating fuel price volatility. Solar energy development in India can also be an important tool for spurring regional economic development, particularly for many underdeveloped states, which have the greatest potential for developing solar power systems which is unlimited and clean source of energy. It can provide secure electricity supply to foster domestic industrial development. So, it can be concluded that photovoltaic or green power systems or the renewable energy generators will have an important share in the electricity of the future not only in India, but all over world. India will emerge as energy itself in future. The study clearly presents a favorable case scenario for RE adoption and expansion. With over 90 per cent of the individuals convinced that renewable energy contributes to a greener lifestyle and more than 95 per cent non-users of RE technologies are willing to adopt renewables in the future, there is tremendous scope for scaling up of RE applications in the country. Citizens have a positive outlook towards renewables and are of the view that it has the potential to gradually replace fossil fuels over the medium-term (say 5–20 years). They also believe that renewables are less harmful to biodiversity, as compared to fossil fuels. While wind energy has a higher potential in India, individuals instead perceive solar to have a higher potential in the country. Solar promotion has always been on a higher scale and hence visibility of solar energy remains highest among individuals. Thus, there is a need for increased awareness and promotion of various schemes and policies related to RE. There is also an increased need to harness the potential of RE sources other than solar and more importantly, make that perceptible to the general masses. Despite a positive way forward for renewables, there are various challenges ahead

that need to be addressed and deployed in future actions. The biggest barrier to uptake and propagation of renewables are the various myths and misconceptions that inhabit the minds of prospective RE adopters. The most common of them being that renewables are expensive and that they are unable to meet the energy demands. It is crucial to make individuals aware of the long-term sustainability benefits associated with RE technologies. There is a need to provide readily available information on RE vendors in a lucid and easy-to-access method. Also, it is very important to break down the information for common citizens in an easy-to-understand manner. Lastly, but of course not the least, there is a need for a shared vision, which the people have identified in the survey. The step to call and take up action is perceived to be of all the stakeholders together– governments, both at the center and the state, institutions, government organizations, NGOs and individuals.

Recommendations: Spread the word! Ask more and more people to shift to renewables. Adopt smart and efficient RE equipment and make the share of RE count. Seek and share information on RE vendors and policies. In coordination with other stakeholders, individuals should take the lead in making a shift to renewables. Reach out to government agencies, manufacturers, NGOs in the renewable energy area in their state to retrieve more information on RE technology, cost and specifications. Individuals should be well aware of their personal/household energy consumption level and gain a thorough understanding of what difference would it make by shifting to renewables.

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