IMPACT OF RENEWABLE ENERGY ON WORLDWIDE INDUSTRIES

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Abstract: *The primary objective for deploying renewable energy worldwide is to advance economic development, improve energy security, improve access to energy, and mitigate climate change. Sustainable development is possible by use of sustainable energy and by ensuring access to affordable, reliable, sustainable, and modern energy for citizens. Strong government support and the increasingly opportune economic situation have pushed India to be one of the top leaders in the world's most attractive renewable energy markets. The government has designed policies, programs, and a liberal environment to attract foreign investments to ramp up the country in the renewable energy market at a rapid rate. It is anticipated that the renewable energy sector can create a large number of domestic jobs over the following years. This paper aims to present significant achievements, prospects, projections, generation of electricity, as well as challenges and investment and employment opportunities due to the development of 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, innovators, project developers, investors, industries, associated stakeholders and departments, researchers, and scientists.*

Keywords: *Renewable Energy, Renewable Power, Renewable Energy Generation, Current Scenario, Strategies, Social recognition of renewable energy*.

Introduction:

The Indian renewable energy sector is the fourth most attractive renewable energy market in the world. India is ranked fourth in wind power, fifth in solar power and fifth in renewable power installed capacity as of 2018. According to 2018 Climate scope report India ranked second among the emerging economies to lead to transition to clean energy.
Installed renewable power generation capacity has increased at a fast pace over the past few years, posting a CAGR of 17.28 per cent between FY14–19. With the increased support of the Indian government and improved economics, the sector has become attractive from in eye of the investors. 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 a crucial role. As a part of its Paris Agreement commitments, the Government of India has set an ambitious target of achieving 175 GW of renewable energy capacity by 2022. These include 100 GW of solar capacity addition and 60 GW of wind power capacity. Government plans to establish renewable energy capacity of 500 GW by 2030.

Market Size

As of February 2020, the installed renewable energy capacity was 86.75 GW, of which solar and wind comprises 34.40 GW and 37.66 GW respectively. Biomass and small hydro power constitute 9.80 GW and 4.6 GW, respectively. Off-grid renewable power capacity has been increased too. As of February 2020, generation capacities for Waste to Energy, Biomass Gasifiers stood at 139.80 MW and 9,806.31 MW, respectively.
Northern India is expected to become the hub for renewable energy in India.

Investments/ Developments

According to data released by the Department for Promotion of Industry and Internal Trade (DPIIT), FDI inflows in the Indian non-conventional energy sector between April 2000 and December 2019 stood at 8282820000.00 euro. More than US$ 42 billion has been invested in India's renewable energy sector since 2014. New investments in clean energy in the country reached US$ 11.1 billion in 2018.

Some major investments and developments in the Indian renewable energy sector are as follows:

Around Rs 36,729.49 crore investment has been made during April-December 2019 by the private companies of India in renewable energy.

Brookfield to invest US$ 800 million in Renew Power.

Renew Power and Shapoorji Pallonji will invest nearly Rs 750 crore in a 150 megawatt (MW) floating solar power project in Uttar Pradesh.

In November 2019, Renew Power, Avaada, UPC, Tata unit won solar projects in 1,200 MW auction of the Solar Energy Corp of India.

As of 2019, India is getting its solar power plant Bhadla Solar Park in Rajasthan, which will be world's largest solar plant, with a capacity of 2,255 MW.

In the first half of 2018, India installed 1 MW of solar capacity every hour.

With 28 deals, clean energy made up 27 per cent of US$ 4.4 billion merger and acquisition (M&A) deals which took place in India's power sector in 2017.

World's largest solar park named 'Shakti Sthala' was launched in Karnataka in March 2018 with an investment of Rs 16,500 crore (US$ 2.55 billion).

Solar sector in India received investments of US$ 9.8 billion in CY2018.

Private Equity (PE) investments in India's wind and solar power have increased by 47 % in 2017 (January 1 to September 25) to US$ 920 million, across nine deals, as compared to US$ 630 million coming from 10 deals during the corresponding period in 2016.

As of March 2019, ever source Capital, a Joint venture of Everstone and Lightsource plans to invest US$ 1 billion in renewable energy in India through its Green Growth Equity Fund.

The international equity investment in the India's clean energy sector was US$ 283 million in 2016, US$ 532 million in 2017 and US$ 1.02 billion in 2018.

Road Ahead

The Government of India is committed to increased use of clean energy sources and is already undertaking various large-scale sustainable power projects and promoting green energy heavily. In addition, renewable energy has the potential to create many employment opportunities at all levels, especially in rural areas. The Ministry of New and Renewable Energy (MNRE) has set an ambitious target to set up renewable energy capacities to the tune of 175 GW by 2022 of which about 100 GW is planned for solar, 60 for wind and other for hydro, bio among other. As of June 2018, Government of India is aiming to achieve 225 GW of renewable energy capacity by 2022, much ahead of its target of 175 GW as per the Paris Agreement. India's renewable energy sector is expected to attract investments of up to US$ 80 billion in the next four years. About 5,000 Compressed Biogas plants will be set up across India by 2023.

It is expected that by the year 2040, around 49 per cent of the total electricity will be generated by the renewable energy, as more efficient batteries will be used to store electricity which will further cut the solar energy cost by 66 per cent as compared to the current cost.* Use of renewables in place of coal will save India Rs 54,000 crore (US$ 8.43 billion) annually5. The renewable energy will account 55 per cent of the total installed power capacity by 2030.

Note: According to Renewable Energy Country Attractiveness index 2018 by EY;

As per data from the Economic Survey;

As per the Confederation of Indian Industry's (CII) report titled 'State Renewable Energy Policies: A Comparative Study'; According to the Bloomberg New Energy Outlook 2018; ** Data from Venture Intelligence; 4 – as per Greentech Media; 5 – Greenpeace India, Union Budget 2020-21

Note: (Conversion rate used as on January 2020, Re 1 = US$ 0.01402

SPV – Solar Photovoltaic System, MWeq - Megawatt Equivalent)

The investment opportunities in renewable energy in India

The investments into renewable energy in India increased by 22% in the first half of 2018 compared to 2017, while the investments in China dropped by 15% during the same period, according to a statement by the Bloomberg New Energy Finance (BNEF). At this rate, India is expected to overtake China and become the most significant growth market for renewable energy by the end of 2020. The country is eyeing pole position for transformation in renewable energy by reaching 175 GW by 2020. To achieve this target, it is quickly ramping up investments in this sector. The country added more renewable capacity than conventional capacity in 2018 when compared to 2017. India hosted the ISA first official summit on the 11.03.2018 for 121 countries.

This will provide a standard platform to work toward the ambitious targets for renewable energy. The summit will emphasize India's dedication to meet global engagements in a time-bound method. The country is also constructing many sizeable solar power parks comparable to, but larger than, those in China. Half of the earth's ten biggest solar parks under development are in India.

In 2014, the world largest solar park was the Topaz solar farm in California with a 550 MW facility. In 2015, another operator in California, Solar Star, edged its capacity up to 579 MW. By 2016, India's Kamuthi Solar Power Project in Tamil Nadu was on top with 648 MW of capacity (set up by the Adani Green Energy, part of the Adani Group, in Tamil Nadu). As of February 2017, the Longyangxia Dam Solar Park in China was the new leader, with 850 MW of capacity. Currently, there are 600 MW operating units and 1400 MW units under construction. The Shakti Sthala solar park was inaugurated on 01.03.2018 in Pavagada (Karnataka, India) which is expected to become the globe's most significant solar park when it accomplishes its full potential of 2 GW. Another large solar park with 1.5 GW is scheduled to be built in the Kadappa region. The progress in solar power is remarkable and demonstrates real clean energy development on the ground.

The Kurnool ultra-mega solar park generated 800 million units (MU) of energy in October 2018 and saved over 700,000 tons of CO2. Rainwater was harvested using a reservoir that helps in cleaning solar panels and supplying water. The country is making remarkable progress in solar energy. The Kamuthi solar farm is cleaned each day by a robotic system. As the Indian economy expands, electricity consumption is forecast-ed to reach 15,280 TWh in 2040. With the government's intent, green energy objectives, i.e., the renewable sector, grow considerably in an attractive manner with both foreign and domestic investors. It is anticipated to attract investments of up to USD 80 billion in the subsequent 4 years. The government of India has raised its 175 GW target to 225 GW of renewable energy capacity by 2022. The competitive benefit is that the country has sun exposure possible throughout the year and has an enormous hydro power potential. India was also listed fourth in the EY renewable energy country attractive index 2018. Sixty solar cities will be built in India as a section of MNRE's "Solar cities" program.

In a regular auction, reduction in tariffs cost of the projects are the competitive benefits in the country. India accounts for about 4% of the total global electricity generation capacity and has the fourth highest installed capacity of wind energy and the third highest installed capacity of CSP. The solar installation in India erected during 2015–2016, 2016–2017, 2017–2018, and 2018–2019 was 3.01 GW, 5.52 GW, 9.36 GW, and 6.53 GW, respectively. The country aims to add 8.5 GW during 2019–2020. Due to its advantageous location in the solar belt (400 South to 400 North), the country is one of the largest beneficiaries of solar energy with relatively ample availability. An increase in the installed capacity of solar power is anticipated to exceed the installed capacity of wind energy, approaching 100 GW by 2022 from its current levels of 25.21226 GW as of December 2018. Fast falling prices have made Solar PV the biggest market for new investments. Under the Union Budget 2018–2019, a zero import tax on parts used in manufacturing solar panels was launched to provide an advantage to domestic solar panel companies.

Foreign direct investment (FDI) inflows in the renewable energy sector of India between April 2000 and June 2018 amounted to USD 6.84 billion according to the report of the department of industrial policy and promotion (DIPP). The DIPP was renamed (gazette notification 27.01.2019) the Department for the Promotion of Industry and Internal Trade (DPIIT). It is responsible for the development of domestic trade, retail trade, trader's welfare including their employees as well as concerns associated with activities in facilitating and supporting business and start-ups. Since 2014, more than 42 billion USD have been invested in India's renewable power sector. India reached US$ 7.4 billion in investments in the first half of 2018. Between April 2015 and June 2018, the country received USD 3.2 billion FDI in the renewable sector. The year-wise inflows expanded from USD 776 million in 2015–2016 to USD 783 million in 2016–2017 and USD 1204 million in 2017–2018. Between January to March of 2018, the INR 452 crore (4520 Million INR, 63.3389 million USD) of the FDI had already come in. The country is contributing with financial and promotional incentives that include a capital subsidy, accelerated depreciation (AD), waiver of inter-state transmission charges and losses, viability gap funding (VGF), and FDI up to 100% under the automated track.

The DIPP/DPIIT compiles and manages the data of the FDI equity inflow received in India. The FDI equity inflow between April 2015 and June 2018 in the renewable sector is illustrated in Fig. 7. It shows that the 2018–2019 3 months' FDI equity inflow is half of that of the entire one of 2017–2018. It is evident from the figure that India has well-established FDI equity inflows. The significant FDI investments in the renewable energy sectors. The collaboration between the Asian development bank and Renew Power Ventures private limited with 44.69 million USD ranked first followed by AIRRO Singapore with Diligent power with FDI equity inflow of 44.69 USD million.

Strategies to promote investments

Strategies to promote investments (including FDI) by investors in the renewable sector:

Decrease constraints on FDI; provide open, transparent, and dependable conditions for foreign and domestic firms; and include ease of doing business, access to imports, comparatively flexible labor markets, and safeguard of intellectual property rights.

Establish an investment promotion agency (IPA) that targets suitable foreign investors and connects them as a catalyst with the domestic economy. Assist the IPA to present top-

notch infrastructure and immediate access to skilled workers, technicians, engineers, and managers that might be needed to attract such investors. Furthermore, it should involve an after-investment care, recognizing the demonstration effects from satisfied investors, the potential for reinvestments, and the potential for cluster-development due to follow-up investments.

It is essential to consider the targeted sector (wind, solar, SPH or biomass, respectively) for which investments are required.

Establish the infrastructure needed for a quality investor, including adequate close-by transport facilities (airport, ports), a sufficient and steady supply of energy, a provision of a sufficiently skilled workforce, the facilities for the vocational training of specialized operators, ideally designed in collaboration with the investor.

Policy and other support mechanisms such as Power Purchase Agreements (PPA) play an influential role in underpinning returns and restricting uncertainties for project developers, indirectly supporting the availability of investment. Investors in renewable energy projects have historically relied on government policies to give them confidence about the costs necessary for electricity produced—and therefore for project revenues. Reassurance of future power costs for project developers is secured by signing a PPA with either a utility or an essential corporate buyer of electricity.

FiT have been the most conventional approach around the globe over the last decade to stimulate investments in renewable power projects. Set by the government concerned, they lay down an electricity tariff that developers of qualifying new projects might anticipate to receive for the resulting electricity over a long interval (15–20 years). These present investors in the tax equity of renewable power projects with a credit that they can manage to offset the tax burden outside in their businesses.

The 2018 renewable energy investment report, source-wise, by the significant players in renewables according to the report of the Bloomberg New Energy Finance Report 2018. As per this report, global investment in renewable energy was USD of 279.8 billion in 2017. The top ten in the total global investments are China (126.1 $BN), the USA (40.5 $BN), Japan (13.4 $BN), India (10.9 $BN), Germany (10.4 $BN), Australia (8.5 $BN), UK (7.6 $BN), Brazil (6.0 $BN), Mexico (6.0 $BN), and Sweden (3.7 $BN). This achievement was possible since those countries have well-established strategies for promoting investments.

The appropriate objectives for renewable power expansion and investments are closely related to the Nationally Determined Contributions (NDCs) objectives, the implementation of the NDC, on the road to achieving Paris promises, policy competence, policy reliability, market absorption capacity, and nationwide investment circumstances that are the real purposes for renewable power expansion, which is a significant factor for the investment strategies.

The demand for investments for building a Paris-compatible and climate-resilient energy support remains high, particularly in emerging nations. Future investments in energy grids and energy flexibility are of particular significance. The strategies and the comparison chart between China, India, and the USA are presented.

France in the first place due to overall favorable conditions for renewables, heading the G20 in investment attractiveness of renewables. Germany drops back one spot due to a decline in the quality of the global policy environment for renewables and some insufficiencies in the policy design, as does the UK. Overall, with four European countries on top of the list, Europe, however, directs the way in providing attractive conditions for investing in renewables. Despite high scores for various nations, no single government is yet close to growing a role model. All countries still have significant room for increasing investment demands to deploy renewables at the scale required to reach the Paris objectives. The table shown is based on the Paris compatible long-term vision, the policy environment for renewable energy, the conditions for system integration, the market absorption capacity, and general investment conditions. India moved from the 11th position to the 9th position in overall investments between 2017 and 2018.

Key findings in renewable energy employment

The findings comprises:

(a) That the majority of employment in the renewable sector is contract based, and that employees do not benefit from permanent jobs or security.

(b) Continuous work in the industry has the potential to decrease poverty.

(c) Most poor citizens encounter obstacles to entry-level training and the employment market due to lack of awareness about the jobs and the requirements.

(d) Few renewable programs incorporate developing ownership opportunities for the citizens and the incorporation of women in the sector.

(e) The inadequacy of data makes it challenging to build relationships between employment in renewable energy and poverty mitigation.

Discussion and recommendations based on the research

Policy and regulation advancements

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.

The central and state government should include a “Must run status” in their policy and follow it strictly to make use of renewable power.

A national merit order list for renewable electricity generation will reduce power cost for the consumers. Such a merit order list will help in ranking sources of renewable energy in an ascending order of price and will provide power at a lower cost to each distribution company (DISCOM). The MNRE should include that principle in its framework and ensure that SERCs includes it in their regulatory framework as well.

SERCs might be allowed to remove policies and regulatory uncertainty surrounding renewable energy. SERCs might be allowed to identify the thrust areas of their renewable energy development.

There should be strong initiatives from municipality (local level) approvals for renewable energy-based projects.

Higher market penetration is conceivable only if their suitable codes and standards are adopted and implemented. MNRE should guide minimum performance standards, which incorporate reliability, durability, and performance.

A well-established renewable energy certificates (REC) policy might contribute to an efficient funding mechanism for renewable energy projects. It is necessary for the government to look at developing the REC ecosystem.

The regulatory administration around the RPO needs to be upgraded with a more efficient "carrot and stick" mechanism for obligated entities. A regulatory mechanism that both remunerations compliance and penalizes for non-compliance may likely produce better results.

RECs in India should only be traded on exchange. Over-the-counter (OTC) or off-exchange trading will potentially allow greater participation in the market. A REC forward curve will provide further price determination to the market participants. The policymakers should look at developing and building the REC market.

Most states have defined RPO targets. Still, due to the absence of implemented RPO regulations and the inadequacy of penalties when obligations are not satisfied, several of the state DISCOMs are not complying completely with their RPO targets. It is necessary that all states adhere to the RPO targets set by respective SERCs.

The government should address the issues such as DISCOM financials, must-run status, problems of transmission and evacuation, on-time payments and payment guarantees, and deemed generation benefits.

Proper incentives should be devised to support utilities to obtain power over and above the RPO mandated by the SERC.

The tariff orders/FiTs must be consistent and not restricted for a few years.

Transmission requirements

The developers are worried that transmission facilities are not keeping pace with the power generation. Bays at the nearest substations are occupied, and transmission lines are already carrying their full capacity. This is due to the lack of coordination between MNRE and the Power Grid Corporation of India (PGCIL) and CEA. Solar Corporation of India (SECI) is holding auctions for both wind and solar projects without making sure that enough evacuation facilities are available. There is an urgent need to make evacuation plans.

The solution is to develop numerous substations and transmission lines, but the process will take considerably longer time than the currently under-construction projects take to get finished.

In 2017–2018, transmission lines were installed under the green energy corridor project by the PGCIL, with 1900 circuit km targeted in 2018–2019. The implementation of the green energy corridor project explicitly meant to connect renewable energy plants to the national grid. The budget allocation of INR 6 billion for 2018–2019 should be increased to higher values.

The mismatch between MNRE and PGCIL, which are responsible for inter-state transmission, should be rectified.

State transmission units (STUs) are responsible for the transmission inside the states, and their fund requirements to cover the evacuation and transmission infrastructure for renewable energy should be fulfilled. Moreover, STUs should be penalized if they fail to fulfill their responsibilities.

The coordination and consultation between the developers (the nodal agency responsible for the development of renewable energy) and STUs should be healthy.

Financing the renewable sector

The government should provide enough budget for the clean energy sector. China's annual budget for renewables is 128 times higher than India's. In 2017, China spent USD 126.6 billion (INR 9 lakh crore) compared to India's USD 10.9 billion (INR 75500 crore). In 2018, budget allocations for grid interactive wind and solar have increased but it is not sufficient to meet the renewable target.

The government should concentrate on R&D and provide a surplus fund for R&D. In 2017, the budget allotted was an INR 445 crore, which was reduced to an INR 272.85 crore in 2016. In 2017–2018, the initial allocation was an INR 144 crore that was reduced to an INR 81 crore during the revised estimates. Even the reduced amounts could not be fully used, there is an urgent demand for regular monitoring of R&D and the budget allocation.

The Goods and Service Tax (GST) that was introduced in 2017 worsened the industry performance and has led to an increase in costs and poses a threat to the viability of the ongoing projects, ultimately hampering the target achievement. These GST issues need to be addressed.

Including the renewable sector as a priority sector would increase the availability of credit and lead to a more substantial participation by commercial banks.

Mandating the provident funds and insurance companies to invest the fixed percentage of their portfolio into the renewable energy sector.

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. This will encourage people to use renewable energy. Furthermore, income tax rebates also can be given to individuals if they are implementing renewable energy applications.

Improvement in manufacturing/technology

The country should move to domestic manufacturing. It imports 90% of its solar cell and module requirements from Malaysia, China, and Taiwan, so it is essential to build a robust domestic manufacturing basis.
India will provide "safeguard duty" for merely 2 years, and this is not adequate to build a strong manufacturing basis that can compete with the global market. Moreover, safeguard duty would work only if India had a larger existing domestic manufacturing base.
The government should reconsider the safeguard duty. Many foreign companies desiring to set up joint ventures in India provide only a lukewarm response because the given order in its current form presents inadequate safeguards.
There are incremental developments in technology at regular periods, which need capital, and the country should discover a way to handle these factors.
To make use of the vast estimated renewable potential in India, the R&D capability should be upgraded to solve critical problems in the clean energy sector.
A comprehensive policy for manufacturing should be established. This would support capital cost reduction and be marketed on a global scale.
The country should initiate an industry-academia partnership, which might promote innovative R&D and support leading-edge clean power solutions to protect the globe for future generations.
Encourage the transfer of ideas between industry, academia, and policymakers from around the world to develop accelerated adoption of renewable power.

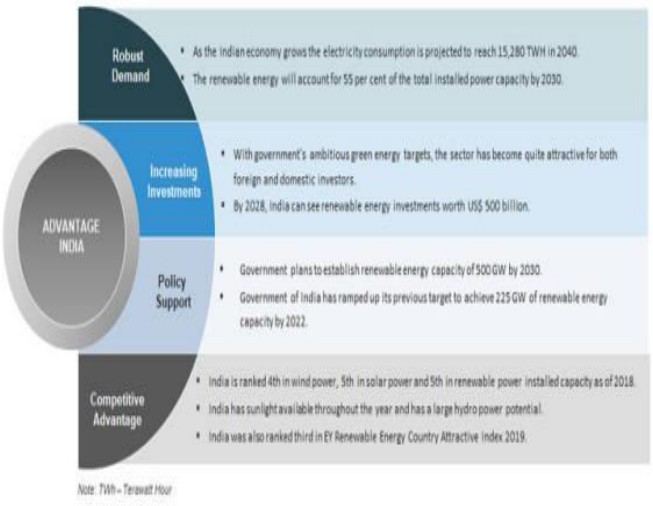
Awareness about renewables

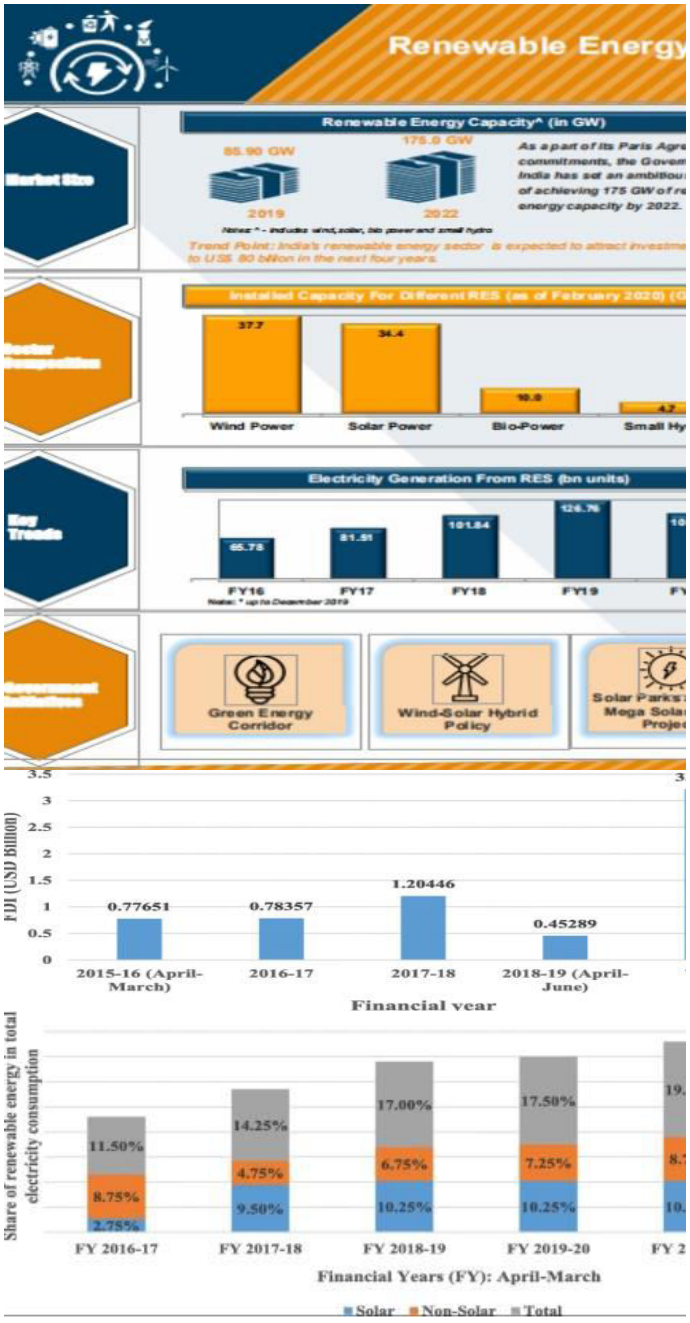
Social recognition of renewable energy is still not very promising in urban India. Awareness is the crucial factor for the uniform and broad use of renewable energy. Information about renewable technology and their environmental benefits should reach society.
The government should regularly organize awareness programs throughout the country, especially in villages and remote locations such as the islands.
The government should open more educational/research organizations, which will help in spreading knowledge of renewable technology in society.
People should regularly be trained with regard to new techniques that would be beneficial for the community.
Sufficient agencies should be available to sell renewable products and serve for technical support during installation and maintenance.
Development of the capabilities of unskilled and semiskilled workers and policy interventions are required related to employment opportunities.
An increase in the number of qualified/trained personnel might immediately support the process of installations of renewables.
Renewable energy employers prefer to train employees they recruit because they understand that education institutes fail to give the needed and appropriate skills. The training institutes should rectify this issue. Severe trained human resources shortages should be eliminated.
Upgrading the ability of the existing workforce and training of new professionals is essential to achieve the renewable goal.

Hybrid utilization of renewables

The country should focus on hybrid power projects for an effective use of transmission infrastructure and land.
India should consider battery storage in hybrid projects, which support optimizing the production and the power at competitive prices as well as a decrease of variability.
Formulate mandatory standards and regulations for hybrid systems, which are lagging in the newly announced policies (wind-solar hybrid policy on 14.05.2018).
The hybridization of two or more renewable systems along with the conventional power source battery storage can increase the performance of renewable technologies.
Issues related to sizing and storage capacity should be considered because they are key to the economic viability of the system.
Fiscal and financial incentives available for hybrid projects should be increased.

Figures





METHODOLOGY SECTION

The data on energy **production** are collected from all enterprises producing primary or converted energy.

The data on energy and fuel **consumption** are collected by sample survey. The population of survey consists of economically active enterprises. Enterprises with more than 49 employees are enumerated completely. The rest of enterprises are sampled.

Data on the households' consumption of energy and fuels have been collected from energy sale enterprises and adjusted on the basis of the energy consumption-related data received from the Household Budget Survey. The consumption of fuels on farms has been calculated based on the sown area of different kinds of crops.

Fuels are grouped as follows: coal and coke, oil shale, peat and firewood, fuel oils, motor fuels, gas and electricity. Up to the year 1992, fuels were recalculated into terajoules according to coal equivalent (1 tce = 29.31 GJ); since 1993, the actual calorific value is used.

The data on the imports and exports of fuels and energy are based on the customs statistics, which have been complemented with the data submitted by enterprises.

Until 1991 the data for imports/exports were received directly from enterprises. In 1992–2004 the data received only from the Estonian Tax and Customs Board were used. When Estonia was acceded to the European Union on 1 May 2004, the Intrastat survey was applied while collecting the data on imports/exports of the EU Member States. Data of the third countries are received, as before, from the Tax and Customs Board.

Results

Renewable electricity production, from sources such as wind power and solar power, is sometimes criticized for being variable or *alternating*, but is not true for concentrated solar, geothermal and biofuels, that have continuity. In any case, the *International Energy Agency* has stated that deployment of renewable technologies usually increases the diversity of electricity sources and, through local generation, contributes to the flexibility of the system and its resistance to central shocks.

There have been "not in my back yard" (*NIMBY*) concerns relating to the visual and other impacts of some *wind farms*, with local residents sometimes fighting or blocking construction. In the United States, the Massachusetts *Cape Wind* project was delayed for years partly because of aesthetic concerns. However, residents in other areas have been more positive. According to a town councilor, the overwhelming majority of locals believe that the *Ardrossan Wind Farm* in Scotland has enhanced the area.

A recent UK Government document states that "projects are generally more likely to succeed if they have broad public support and the consent of local communities. This means giving communities both a say and a stake". In countries such as Germany and Denmark many renewable projects are owned by communities, particularly through cooperative structures, and contribute significantly to overall levels of renewable energy deployment.

The market for renewable energy technologies has continued to grow. *Climate change* concerns and increasing in *green jobs*, coupled with *high oil prices*, *peak oil*, oil wars, *oil spills*, promotion of *electric vehicles* and renewable electricity, nuclear disasters and increasing government support, are driving increasing renewable energy legislation, incentives and *commercialization*. New government spending, regulation and policies helped the industry weather the 2009 economic crisis better than many other sectors.

While renewables have been very successful in their ever-growing contribution to electrical power there are no countries dominated by fossil fuels who have a *plan to stop*

and get that power from renewables. Only Scotland and Ontario have stopped burning coal, largely due to good natural gas supplies. In the area of transportation, fossil fuels are even more entrenched and solutions harder to find. It's unclear if there are failures with policy or renewable energy, but twenty years after the Kyoto Protocol fossil fuels are still our primary energy source and consumption continues to grow.

CONCLUSION

The renewable sector suffers notable obstacles. Some of them are inherent in every renewable technology; others are the outcome of a skewed regulative structure and marketplace. The absence of comprehensive policies and regulation frameworks prevent the adoption of renewable technologies. The renewable energy market requires explicit policies and legal procedures to enhance the attention of investors. There is a delay in the authorization of private sector projects because of a lack of clear policies. The country should take measures to attract private investors. Inadequate technology and the absence of infrastructure required to establish renewable technologies should be overcome by R&D. The government should allow more funds to support research and innovation activities in this sector. There are insufficiently competent personnel to train, demonstrate, maintain, and operate renewable energy structures and therefore, the institutions should be proactive in preparing the workforce. Imported equipment is costly compared to that of locally manufactured; therefore, generation of renewable energy becomes expensive and even unaffordable. Hence, to decrease the cost of renewable products, the country should become involve in the manufacturing of renewable products. Another significant infrastructural obstacle to the development of renewable energy technologies is unreliable connectivity to the grid. As a consequence, many investors lose their faith in renewable energy technologies and are not ready to invest in them for fear of failing. India should work on transmission and evacuation plans.
Inadequate servicing and maintenance of facilities and low reliability in technology decreases customer trust in some renewable energy technologies and hence prevent their selection. Adequate skills to repair/service the spare parts/equipment are required to avoid equipment failures that halt the supply of energy. Awareness of renewable energy among communities should be fostered, and a significant focus on their socio-cultural practices should be considered. Governments should support investments in the expansion of renewable energy to speed up the commercialization of such technologies. The Indian government should declare a well-established fiscal assistance plan, such as the provision of credit, deduction on loans, and tariffs. The government should improve regulations making obligations under power purchase agreements (PPAs) statutorily binding to guarantee that all power DISCOMs have PPAs to cover a hundred percent of their RPO obligation. To accomplish a reliable system, it is strongly suggested that renewables must be used in a hybrid configuration of two or more resources along with conventional source and storage devices. Regulatory authorities should formulate the necessary standards and regulations for hybrid systems. Making investments economically possible with effective policies and tax incentives will result in social benefits above and beyond the economic advantages.

ABBREVIATION

AD:
Accelerated depreciation

BU:
Billion units

CEA:
Central Electricity Authority of India

CERC:
Central electricity regulatory commission

CFA:
Central financial assistance

EOI:
Expression of interest

FDI:
Foreign direct investment

FiT:
Feed-in-tariff

GW:
Giga Watt

MNRE:
Ministry of new and renewable energy

MW:
Mega Watt

R&D:
Research and development

RPO:
Renewable purchase obligations

SERC:
State electricity regulatory

SHP:
Small hydropower

TWh:
Terawatt hours

WTE:
Waste to energy

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