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INDIA'S RENEWABLE ENERGY PUSH: A WAY TOWARDS SUSTAINABLE DEVELOPMENT

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ABSTRACT

The researcher has tried to understand the challenges of non-renewable resources and with reference to that tries to provide the solution for India's energy need. The researcher has also highlighted the increasing significance of renewable energy sources and several initiatives taken in that regard. Throughout this paper the researcher has used the descriptive and analytical methodology for the study of the concern issue. The global energy sector has seen major transition throughout the ages because of the evolution of technology. We are in the midst of a similar major energy transition again. Fossil fuel completely ruled the energy sector in the 20th century. However, in the present century technological development in the energy sector started responding to pollution caused by the fossil fuel and its harmful and long-term repercussions. New technologies in electric vehicles, evolution in photovoltaic cells, electrolysers and fuel cells provided an opportunity to transit away from fossil fuel. The Indian energy sector too not only embraced the new technological innovation. The Government of India has provided a desired push to the renewable energy sector in order to achieve climate change goals which it has committed in the Paris conference. It has brought schemes to promote solar parks, wind energy and hydrogen sector and its positive responses are already started surfacing. In the time to come, India will emerge as a major global energy player for renewable energy manufacturing sector.

Keywords- Electric mobility, fuel cell and electrolyser technologies

INTRODUCTION

The speech delivered by Prime Minister Narendra Modi at the COP 26 in Glasgow has again brought the focus on renewable energy

in India's energy basket. India's ambitious target to achieve new zero carbon emission by 2070 stunned the world. India declared its plan to have installed renewable capacity to 500 GW by 2030 which will contribute half of the nation's entire energy needs. This pledge will also reduce carbon emission by 1 billion tonnes. India already has embarked on the path to setting new heights in renewable energy. At the end of third quarter of 2021, India's installed renewable energy capacity has touched 101.53 GW mark. Solar energy has the biggest contribution with 46 GW which is followed by wind energy with 39.9 GW percent. Other renewable energy sources are biomass with 10 GW, small hydro energy at 4.78 GW percent and hydrogen at an infant stage. [i]

India's push for renewable energy is attributed mainly to two causes, to achieve climate change goals as set by the Government of India and to reduce dependence on the import of energy. However, before highlighting the causes, it is necessary to overview the present and projected energy scenario of the country. India is a fast-developing economy and is likely to maintain pace in the years to come. India's fast-growing economy would require massive amounts of energy in its development journey. There is a herculean task before the government is both quantitative as well as qualitative in the energy sector. It is projected that the country's power requirement would reach around 817 GW by the end of 2030 from the current level of 390 GW.[ii] India will have to make a higher quantity of energy available in order to sustain the economic development.

The challenge is further compounded by the qualitative factor because the increasing use of energy should not lead to higher carbon emission. India is the third largest emitter of greenhouse gases behind China and the United States and the Government wants to bring it down to sustainable levels.Many developing nations in Europe and North America have achieved economic development in the last centuries with much higher amounts of carbon emissions. The industrial revolution that took place in these economically developed Western nations was entirely based on coal and oil. But India does not have the luxury of unlimited carbon emission even if it is on its developmental path. India is committed to curtailing carbon emission. India will have to shift from hydrocarbon resources to renewable sources over the period.

India has behaved as a responsible nation and supported the global movement against the environmental degradations. As mentioned above, In the recent COP-26 climate summit in Glasgow, India declared its intentions to achieve a net zero goal for

emission by 2070. India, right from the inception participated in the climate change movement. At the COP 21 in Paris Climate Change Conference in 2015, India pledged to curtail its carbon footprint from its 2005 level to 33 to 35 percent by 2030.[iii] India further declared in the conference that it will generate 40 percent of its need from non-fossil fuel resources by 2030 and would add 450 GW of renewable energy by 2030. The Indian government was well aware of the implications of self-imposed restrictions could affect its economic growth. Renewable energy till the Paris conference was still not economically competitive against hydrocarbon resources but in the larger interest of humanity, India decided to take hard decisions.

The other reason for India's emphasis on renewable energy is to reduce its dependence on import of fossil fuel. India is also highly dependent on hydrocarbons from the Middle East and other parts of the world,as a result any geopolitical matter will leaves a deep scar on the Indian economy. India suffered its worst oil shock in 1991 during the Gulf war when India was left with oil reserves sufficient for barely a few weeks. It was a major threat to Indian security because India would have faced an extremely difficult situation to defend its borders in case of any armed attack for the want of oil for its armed forces. The impact of the shock was very strong and India brought a complete reform in its economy to tide over the shock. The economy suffered another shock in 2008 when the international crude oil prices reached its peak price of $148 per barrel leaving high inflationary pressure.

Following are the various energy sectors in India which contribute in the India's move towards sustainable development.

Solar

Solar energy has emerged as an important source of energy not only for India but for the world. The technological innovation mainly in terms of efficiency of solar cells over the last two decades has significantly brought down the cost of electricity production. In the year 2016, solar energy became cheaper than coal fired electricity energy and its impact was so strong that in the past few years, no major thermal project was initiated all over the world including India. There is a race set all over the world to tap the ubiquitous solar energy spread across geographies. India is particularly gifted with abundant Direct Normal Irradiance (DNI), almost all over the nation. It is estimated that sunlight availability is equal to 4 to 7 kWh per square meter. India has an average of 250 to 300 sunny days where solar energy can be generated through photovoltaic

cells. "It is further estimated that the potential for solar energy in India is about 5000 trillion kWh per, which is much more than India's current electricity generation of 390 GW".[iv]It is calculated that only a total land area of 300 km square would be sufficient to generate the country's entire electricity requirement, which is only 0.1 percent of total land in the country.

The Government of India has pursued its solar dream for the last several decades but emphasis given in the last decades yielded decisive results. The government launched the Jawaharlal Nehru Solar Mission (JNNSM) in January 2020. The mission aimed to popularize solar energy in the country and to install 22,000 MW of solar electricity in both grid connected and off grid power plants. In the subsequent stage, the government opened tenders for the creation of solar parks for both the public and private sector. The price of electricity generation quoted every year observed a fall in the price with the latest round seen even less than Rs 2 per unit. Bhadla Solar Park today is considered as one of the largest solar parks in the world with a capacity of 2.2 GW. "With Hero Future Energies (HFE), commissioning a 300 MW project at Bhadla-III Solar Park, the solar park is now fully operational."[v]

The government also laid emphasis on manufacturing of solar cells and panels under its ambitious programs like Make in India and 'Atmanirbhar Bharat Abhiyan'. With the phenomenal growth in solar installation, India became dependent on Chinese and Malaysian imports for its solar energy needs. The domestic manufacturing units were barely sufficient to manufacture solar cells and panels. The latest scheme offered by the government is Production Linked Incentive (PLI) Scheme and allotted budgetary outlay of 4,500 crores in 2021. This scheme is expected to add a capacity addition of 10 GW in high efficiency integrated solar photovoltaic (PV) manufacturing plants. Some of the leading players in the energy sector both in the public and private sectors like Reliance and Adani group have committed themselves in manufacturing in the solar energy sector.

Wind

Wind energy has been around four decades in India and observed a steady growth throughout the period. Wind energy for the last several decades dominated the renewable energy scenario in India, it is in the last few years solar energy has overtaken it. As per the National Institute for Wind Energy (NIWE), India's wind power has tremendous potential at different levels. At a 50f meter hub height, the potential is measured at 49 GW, the estimated potential at 80 meters is 102 GW. The potential increases as height increases, at 100

meters the potential is estimated at 302 GW but at 120 meters it increases to 695 GW, if the entire potential is trapped, wind energy alone can provide the energy requirements of the country.[vi] The profitable location for the installation of wind turbines is spread across the country mainly along the coastline for offshore wind energy as well as in the Exclusive Economic Zone (EEZ). With reference to wind energy in India, there is use of Geographical Information System (GIS) Technology for various wind energy mapping techniques.

India currently has around 39.9 GW installed capacity in wind energy with major wind power installations in Tamil Nadu, Gujarat, Karnataka, Maharashtra and Rajasthan. India has the fourth largest wind energy installed capacity in the world behind China, the United States and Germany. Wind energy is competitive in India with per unit cost estimated around less than Rs 3. The government has an ambitious target of installing 5 GW of offshore capacity by 2022 and 30 GW by 2030. The domestic wind energy market is closely supported by the Wind Turbine manufacturing sector. There are many companies both Indian as well of overseas origin involved in manufacturing of wind turbines in India. The leading companies are Vesta India, Suzlon Energy Limited, Re Gen Powertech Pvt Ltd. etc. These companies not only serve the local market but are involved in exports of wind turbines across the world.

There have been various challenges when it comes to the India's wind energy sector. Over the past few years, the growth of solar energy has been made tremendous progress. However, the growth of wind energy has not reach up to the mark. "The wind power industry and experts highlight that the reason for the stagnation is the shift to auction route that seeks the lowest per-unit cost in the wind sector, lack of financial incentives and difficulties in finding land for the projects." [vii] Various provisions with this regard are initiated by the Union Ministry of New and Renewable Energy (MNRE).

Hydrogen

Hydrogen is the latest source added in the list of renewable energy at the global level and its consumption is at the nascent stage but it has a huge promise. The biggest advantage associated with hydrogen is that it is abundantly available across the globe. Once hydrogen becomes the main source of energy for the world there will not be geopolitical tension over energy as it is seen today. This will be a boon for countries like India which imports over two third of energy from across the world. Hydrogen is placed today where

solar and wind energy stood a few decades back and were waiting for a technological push to become a mainstream energy source. However, it is further said that the hydrogen sector will largely ride on excess renewable energy from solar and wind farms which will be utilized to produce hydrogen.

The cost of production of hydrogen is constantly falling with more and more research on various components associated with hydrogen production. The technical improvement in electrolysers has brought down the cost of production in the last five years. Hydrogen is likely to make an impact in the year to come with the fall of cost. It is predicted that there would be about 500,000 Fuel Cell Electric Vehicles (FCEV) by 2032 which would significantly replace the automobile running on fossil fuel today. The use of hydrogen is not restricted only to the transportation sector, it is expected to be utilized as a green fuel in various other sectors. In Sweden, hydrogen is utilized in a furnace in a steel plant replacing coal and natural gas. This brought a huge benefit both financially and environmentally. Green hydrogen can be utilized in other industries like oil refineries and fertilizer sector as a fuel.

India has taken early initiatives in utilizing hydrogen as a fuel. Earlier, India has missed the solar revolution and lithium-ion battery revolution which changed the energy scenario significantly in the present century. India does not want to miss the hydrogen revolution. The biggest announcement was the National Green Hydrogen Mission 2021 by Prime Minister Modi during his Independence Day speech. The mission is a part of making India energy Atmanirbhar in the next few decades.[viii] The plan is to have 15 GW capacity in hydrogen production in the next five year. The policy further promoted the use of green hydrogen in other sectors and set a target around 10 percent of overall needs of refiners from 2023/24. Similarly, policy further suggested that the fertilizer sector up to 20 percent.

The government announced special measures to manufacture electrolysers and fuel cells in India through the Production Linked Incentive (PLI) scheme. The government with the PLI scheme wants to create a national hydrogen supply chain. This scheme received overwhelming response from both the public as well as private sector. Reliance Industries Limited (RIL), India's biggest private sector company has taken active interest in the hydrogen sector along with the renewable sector where it has committed $20 billion. Reliance wants to manufacture cheaper electrolysers and solar cells as it treats silicon and hydrogen as 'New Oil". Adani group is

another major private sector company investing in the hydrogen sector. In the public sector, Indian Oil, GAIL and NTPC are actively investing in the hydrogen sector.

Challenges in Implementation

The renewable push by the government is likely to face many challenges. It is estimated that the cost of such a push would require Rs 6 trillion, a huge sum. The budgetary allocation for such huge sums will have implications on other sectors of the economy and it will be difficult for the government to bear it. Another important reason is about coal, which is the mainstay of Indian electricity production. In Spite of a major push in the last decade for solar and wind electricity, there is continuous rise in coal utilization. It is estimated that coal capacity is projected to increase from 202 GW in 2021 to 266 GW by 2029-30. It is a broader question; will the Indian energy sector be able to get rid of coal? It is not still possible because shifting a major source within a short span may lead to chaos. As mentioned earlier, India is a growing economy, and any chaos in the energy sector will have serious repercussions on the economic growth.

CONCLUSION

The global energy sector has seen major transition throughout the ages because of the evolution of technology. We are in the midst of a similar major energy transition again. Fossil fuel completely ruled the energy sector in the 20th century. However, in the present century technological development in the energy sector started responding to pollution caused by the fossil fuel and its harmful and long-term repercussions. A major challenge before researchers was to develop technology which will not only be emission free but also cost competitive in comparison with fossil fuels. Electric mobility strongly emerged as an answer to fossil fuel. Battery technology, evolution in photovoltaic cells, electrolysers and fuel cells provided an opportunity to transit away from fossil fuel. The Indian energy sector too not only embraced the new technological innovation but tried to be part of evolution in order to get a bigger share in the global energy sector.

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