**CHINA’S JOURNEY OF RENEWABLE ENERGY DEPLOYMNET: LEARNING FROM THE INITIATEVES UNDERTAKEN BY GLOBAL LEADER**

**INTRODUCTION**

It is the established theory that “the nation who procreates power from sustainable energy sources will be a global leader in twenty first century”. China is the nation which has put forward the biggest initiatives to foster green growth in the country and have become world leader in the adopting and deploying Renewable technologies. China is not only investing huge amount in renewables but have also framed mandatory regulations for promoting green growth in the country. Determined targets have always been the primary step towards transiting the energy sector in a country and implementing them through mandatory regulations is the additional factor responsible for real growth in any sector. Besides the government policies and investment programs and determined targets, the country also passed a separate and mandatory law on the subject in 2005 which commenced in January 2006. The law is considered as the base for the growth of renewables in the Nation. Such a remarkable growth of renewable energy sector in China is an outcome of regulations based on the provisions of its pioneering “*Renewable Energy Law*, 2005”. Some of the significant provisions of the law includes stable renewable energy objectives; an obligatory link and consumption policies; a nationwide tax terms; and provisions for apportionment of costs and grants for renewable sector. This study provides an analysis of the regulatory, governmental, and fiscal arrangements fostering clean energy growth in China and comparing the regulatory set up of India and China in order to identify the gaps and shortcomings in the existing National framework for promoting RE sector.

**CHINA’S ENERGY STATISTICS AND TARGETS**

Currently worlds total renewable energy capacity is around 2006.2 GW as of 2016, out of which more than one fourth of the world total capacity that is about 545 GW comes from the China alone.[[1]](#footnote-1) China is currently a world leader in wind and hydro energy sectors. Hydropower is the China’s leading source of renewable energy, currently country has 333.6 GW of installed hydro-power, making China the leading producer of hydro energy at the global level, which is around ¼ of the world’s total hydropower installed capacity. Wind occupies the second position among major source for renewable power in China, with installed capacity in 2016 reaching 148 GW as compare to world total of 466 GW.[[2]](#footnote-2) According to “Bloomberg New Energy Finance (BNEF), China in the year 2017 invested around $132.6 billion in clean energy sources which accounts for 33% of the global investment in renewables ($335 billion) in the same year. The next largest investment came from the U.S.A, which was around $57 billion where India just invested $11 billion which accounts to only 10% of the China’s investment in the same year.[[3]](#footnote-3) Thus it is clear that China is investing good amount for utilizing green energy technologies as compared to other countries.

As stated earlier China occupies the top position worldwide in energy consumption, and contributed to around 34 % of total demand for energy growth worldwide in year 2017. In year 2017, there was an increase of 36% of energy consumption through renewables worldwide, where China contributed for around 22% of the total growth.[[4]](#footnote-4)

Although, coal is still dominating the production of energy in the country but a declining trend in utilization of conventional sources of energy is evident. It is estimated that the share of coal in energy production i.e. 62% in 2016 will be declined to 36% in the year 2040.[[5]](#footnote-5) It is expected that because of fundamental shifts in the economy and dedicated energy policies, total energy demand growth by year 2040 will be approximately the same level of as experienced in the eight years between the period of 2008 and 2016. The Renewable Energy arrangements in country is mounting promptly, rising at the rate of 9.5% per annum and is estimated to account more than 30% of renewable energy share at the global level.[[6]](#footnote-6)

Thus it can be inferred that China’s population growth is declining while the energy demand rate is also declining.[[7]](#footnote-7) The government of China has also formulated medium term and long-term schemes for the growth of green energy sector which sets goal of achieving “10% of primary energy demand with renewables by 2010 and 15% by 2020”. Further there is target to expand total power installation capacity as of 968 GW in 2010 to 1786 GW by year 2020, renewable installation of which account for 250 GW (26%) in 2010 to at least 600 GW (33.6%) by 2030.[[8]](#footnote-8)

China is concurrently considered as the “greenest and the blackest place on earth”, as the global leader in clean energy deployment and on the other hand is a major emitter of carbon dioxide.[[9]](#footnote-9) The electric power sector in the country shares nearly 30% of China’s carbon emissions as coal accounts for more than 70% of electricity generation in the country which is a chief source of carbon emissions.[[10]](#footnote-10) The country is world’s largest coal consumer around 40% of the world’s coal consumption comes from China itself.[[11]](#footnote-11)As the economy and infrastructure of the country develops the country’s demand for energy raises. Referring to a report, China has to increase its power generation capacity by four times as of levels of 2005, to satisfy the energy requirements in 2030.[[12]](#footnote-12)

Therefore in order to check energy efficiency as well as environment concerns occurring due to use conventional energy resources, China have to show remarkable progress in clean energy sector, one estimate shows that if China generates 8 % of its energy from solar technologies it may reduce up to 50% of currently projected gas emissions by 2030.[[13]](#footnote-13) In year 2009 the China’s Government took an initiative to cut “carbon intensity” by 40% from 2005 levels by the year 2020.[[14]](#footnote-14)Such an initiative also included a government assurance to maximize the energy production from renewable resources.[[15]](#footnote-15) The “National Development and Reform Commission’s” in year 2007 launched a “National Climate Change Programme” and in year 2008 issued a “White Paper” containing explicit commitments towards renewable energy deployment to support climate change mitigation. By the end, of year 2007 NDRC endorsed a medium and long-standing expansion plans for RE sector, with a target of achieving total 15% energy consumption from renewables by year 2020.[[16]](#footnote-16)

**RENEWABLE ENERGY REGULATION IN CHINA**

**Historical Background**

The green growth in electricity sector in China began with the adoption of the “New and Renewable Energy Development Program” in 1996. Subsequently, the State Council has progressively started governing the Chinese power sector towards a more sustainable industry by making effective provisions for promoting clean technologies. The subordinate level law making bodies followed the directions of State Council and started making supporting regulations for the respective provinces. China’s legal mechanisms on renewables is bit different as compare to other countries because of its strong “Renewable Energy Law”, government policies, incentives, and aggressive mandates promoting renewables.[[17]](#footnote-17)

Prior to the approval of the “Renewable Energy Law” in year 2005, there were no concentrated laws to support clean energy transition in the country. The enactment of a law specifically dealing with renewable, integrated the legal framework regulating the renewable sector. However, the new law gave direction to the agency’s efforts and made numerous aggressive treads forward. It created a Centralized scheme for the expansion of renewable sector, by implementing stringent objectives for RE deployment. Further the law authoritatively encouraged the production of electricity from renewables by making it a national priority.

**Analysis of Renewable Energy Law**

“Renewable Energy Law of the People’s Republic of China”, was adopted at “National People’s Congress”, on February 28, 2005 which consisted of 8 Chapters divided into 33 Articles. Article 1 of the regulations provides the objectives of the law, which includes promotion of renewable energy, upturn the part of renewables in energy supply; ensure energy security, environment protection, the sustainable development. Article 2 defines the term “renewable energy source” –“as non-fossil energy resources including wind energy, biomass energy, solar energy, hydropower, geothermal energy, and marine energy,” but nuclear power is excluded from the definition, which is being regulated and promoted through distinct laws.[[18]](#footnote-18)Article 4 of the law declares that increasing the share of renewables in the total energy mix will be the Nation’s priority. Further, Article 8 obligates NDRC to formulate and execute a nationwide renewable energy strategy, providing determined renewable energy targets, and guiding the provincial agencies in formulating supplementary execution plans at provincial levels.

Article 14 provides for “Mandatory Connection Policy”, the utmost significant provision of “Renewable *Energy Law”,* which obligates Chinese power grid companies to link the energy produced through renewables to the grid and ensure procurement of all the electricity produced from renewable resources in their respective areas.

The NDRC’s “Regulation on the Administration of Power Generation from Renewable Energy” and the SERC’s “Measures on Supervision and Administration of Grid Enterprises in the Purchase of Renewable Energy Power”[[19]](#footnote-19) are the two separate national regulatory frameworks which supported the implementation of Article 14 of the Law by requiring the interconnection and compelling the grid corporations to purchase all the green energy produced within their jurisdiction.

Further Article 29 of the law makes this provision more effective by providing legal responsibility in case of violation of Art 14. Article 29 provides that if an electric grid corporation faces failure in purchasing the entire quantity of electricity generated through renewables and thereby causing considerable losses to the generating power with the help of such energy, the grid corporation in fault shall be held liable for compensation, and the State power regulatory institute shall order the corporation to resolve the same in a given time frame and incase the corporation rejects to make requisite changes, then grid corporation shall be imposed with a fine which should not exceed the sum of total losses confronted by the concerned power business enterprise. Also 2009 amendments to the Art 29 made the penalties more stringent, as of now power producing enterprises are entitled to the compensation around the double of the total loss suffered.[[20]](#footnote-20) China released an “Energy Production and Consumption Revolution Strategy” for period of 2016 to 2030, in 2014 for an “energy revolution”, an exhaustive measure to support the execution of the 13th Five-Year Plan.

**Renewable Energy Promotional Mechanism**

China’s “*Renewable Energy Law*” which was adopted in 2005, serves as the principal structure for growth of the renewable sector. This law provides a range of financial benefits and policies to support the deployment of renewables in the country. Under the principles of “*The Renewable Energy Law”*, Government formulated following Promotional Mechanisms:

***Planning and Targets***

As stated earlier Article 4 of the law requires that a target regarding total renewable energy to be generated and consumed to be established out of the energy portfolio of China. As per the provision, various administrative instructions and strategies, like “the Eleventh Five-Year Plan for Renewable Energy Development (EFYPRED)” and the “Mid- Term and Long-Term Plan for Renewable Energy Development (MLTPRED)”, were published to give details as what the goal ought to be. Based on the provision of the RE Law it largely concentrates on improving the supply of the RE. The MLTPRED programme, provided “that at least 10% of total energy consumption in China by 2010 and 20% by 2020”, shall come from renewables.[[21]](#footnote-21) Further “The 13th Renewable Energy Development Five Year Plan (2016-2020)” was adopted by NEA in year 2016 providing mandatory objectives for renewable energy consumption until 2020. Different targets were set for each financial year plan for different renewable energy technologies.[[22]](#footnote-22)

Following is the strategy layout of China from promoting green growth in the country:

* Rise in share of renewables in total energy consumption to 15% by 2020 and to 20% by 2030.
* Intensification of installed renewable energy capacity to 680 GW by 2020.
* Rise installed wind capacity to 210 GW.
* Encourage offshore wind energy projects.
* Promote renewable power technology improvement.
* Encourage production and manufacturing of the renewables technologies within China in order to decrease dependence on imports.

***Mandated Grid Connection***

The REL provided for the mandatory grid connection and “cross subsidization” as the mechanism to provide sufficient support and stability renewable energy producers. Further Article 14 requires that organizations that control electricity grid that is the “State Power Grid” and the “China South Power Grid” – shall enter into contracts with authorized renewable power generators to procure all grid-connected power generated by them. The “State Electricity Regulatory Commission (SERC)”issued order No. 25, making it mandatory for Grid Operators to buy all renewable electricity generated in the year. Further “the Management Regulations for Renewable Energy Power Generation, The Trial Management Measures for Renewable Power Pricing, The Catalogue for the Guidance of Renewable Energy Industry Development, and The Regulations of Power Enterprises” are regulations established under the RE Law that provides that power grid operators need to procure resources from registered RE producers.

***Feed-in Tariffs***

China has also adopted the FIT mechanism for determining the energy prices in the country as rapid deployment of renewables can’t be achieved without the effective tariff policy. The tariff policy in china is different for different technologies. As, pricing mechanism of wind energy in China has witnessed different stages like: tariff authorization stage, concurrence of bidding price mechanism and authorized tariffs, bidding and consenting stage and fixed approved tariffs stage. The “Improving Policies on the Feeding Tariff of Wind Power” circulated by NDRC in year 2009, sanctioned a definite and stable FIT.[[23]](#footnote-23) The whole country was distributed into four categories according to the technology and region. The standard tariffs fixed for the categories were “0.51, 0.54, 0.58 and 0.61 RMB/kWh” respectively.[[24]](#footnote-24)

Whereas prices for solar energy in the country passed through three stages that are: the approved tariff stage, competitive bidding stage and stable tariff stage. In year 2011, China issued a new strategy on the FIT for solar energy. The “Improving Policies on the Feed-in Tariff of Solar Photovoltaic Power” issued in 2011, provided an integrated tariff for solar energy projects. The nationwide tariff set was“RMB 1.15/kWh for the developments approved by December 31, 2011, and RMB 1.0/kWh for projects completed by July, 2011.[[25]](#footnote-25)

***Special Fund Mechanisms, Taxation and Credit Systems*:**

Government have been providing subsidies for promoting renewables long before the enactment “Renewable Energy Law”. For instance, in 1999, the State Council declared an advance of “1 billion RMB for small and medium sized projects;” with an objective to achieve energy effectiveness and to utilize renewable technologies. More than thousand projects have already availed benefit of the fund.[[26]](#footnote-26) These government funds can be utilized in two ways; firstly, in the form of grants and secondly in the form of loans provided at low rate of interest.

Further, “*The Department of Resource Conservation and Utilization*” of the “State Economic and Trade Committee” facilitated loans at minimal rate of interest out of the State budget to nurture the expansion of RE industry. Also various State Governments have been using income generated from tax revenues for promoting green growth within the State[[27]](#footnote-27). Nonetheless, before the obligatory law, these subsidies were not paid on mandatory basis, as the subsidies were subject to variations in policies. As per the provisions of “Renewable Energy Law”, a comprehensive system for providing subsidies and funds was established which also provided a national fund for RE sector. The money for the fund is collected in the form of general taxes. In 2006, the NDRC issued ‘‘Guidelines for Using the Public Fund for Renewable Energy Development’’.

The guidelines mentioned III priorities. Ist priority is to encourage generation of power from renewable resources and IInd one is to promote research and innovation in clean energy technologies and further to augment utilization of renewables in heating and transport sector.

**ADMINISTRATION OF RENEWABLE ENERGY IN CHINA**

**The National Energy Commission:**

“The National Energy Commission (NEC)” is the key body responsible for development of energy sector at national level. The Commission analyzes and frame national energy policies, energy strategies and also provides coordination of the major initiatives for clean energy growth at provincial levels. The Commission consists of 21 ministers and number of directors from various government departments and Central Bank.

**The National Energy Administration**:

“The National Energy Administration (NEA)”works under the guidance of NDRC. The NEA replaced Energy Bureau under NDRC and now manages the bureaus functions. Also, other energy organisations and government offices were merged under NEA like “Commission of Science, Technology, and Industry for National Defense (COSTIND)”. The function of the Commission is to regulate and manage the energy industries and drafting plans and strategies for negotiating with foreign energy organizations and also includes authorizing investments from the foreign countries. Further NDRC authorize NEA to look after energy generation, research and innovation, international collaboration related to energy sector.

Additionally, there are various departments working directly or indirectly to implement regulations related to renewable energy sectors:

* Ministry of Science and Technology (MOST)
* Ministry of Finance (MOF)
* Ministry of Construction (MCon)
* State Environment Protection Agency (SEPA)

Further China is also planning to establish an independent energy ministry to look after the country’s power sectors including the policy making and regulating the renewable energy sector. This new independent ministry would substitute the existing regulator, “the National Energy Administration (NEA)”, and, the “National Development & Reform Commission (NDRC)”[[28]](#footnote-28) and will not work under these commissions. The ministry would be handling the energy sector independent of the intervention of the commissions; the idea behind the ministry is to make the energy sector regulations more effective and integrated.

**CONCLUSION**

India and China both are major energy consumers worldwide because of large and consistently increasing populations. Thereby, both the countries are struggling with issues of energy access, energy related climate problems unaffordable energy services and increasing poverty in the nation. Also both the nations have prominent energy-oriented policies and regulations that focus on increase in the more consumption of RE sources. Nevertheless, there are also similarities and dissimilarities between both the countries with regard to the approach adopted by the countries for promoting clean growth. China has comparatively set up more aggressive targets. The India has targeted “175 GW of Renewable installed capacity by year 2022 out of which 100 gigawatts (GW) of solar capacity and 60 GW of wind capacity by 2022”. Whereas the China aims to have “150-200 GW of solar and 250 GW of wind installed by 2020 and achieve 20 percent of energy consumption by 2030 from non-fossil sources.

India and China are the largest contributors of carbon emissions worldwide, including USA the three countries are accountable for nearly half of worldwide emissions coming from energy sector where as in India, per capita emissions are low as compare to China and USA. In India per capita emissions are - “1.6 tons, about 1/3 of the global average and ¼ of level of China”. In China, per capita emissions are 6.2 tons which is comparable to the per capita emissions of the EU.

Further both countries have composite energy governing and regulatory mechanism. India’s energy policy-making is in decentralized form, because of federal structure adopted by the country. In India, the Centre has authority over energy resources and few taxes, whereas States have jurisdiction over “water and land rights, natural gas infrastructure, and taxation of mineral rights and the consumption and sale of electricity”. Whereas states are also given powers in determining tariffs for energy, framing renewable energy policies in their respective states, enforcing the policies and implementing them are also the states prerogative, where Centre Govt. only plays role of guiding the states. There is no such body that has supreme authority over integrating policies at state level. There are numerous ministries and authorities which frame polices, regulations, deployment strategies on different aspects of the energy which ultimately result in ineffective decisions.

Whereas energy regulation in China is integrated and more centralized. The strategy and policies for energy sector is framed by the State Council, under the directions of the “Chinese Communist Party”. “National Development and Reform Commission (NDRC)”, a commission under State council majorly frame and execute energy policies. These policies act as guidelines and are implemented at state level through regional level NDRCs so that the decisions of central government get proper consideration. In China the execution is much easier as it is not a federal country and the states are subordinate to the central government.

Further China enacted a separate law for regulating renewable energy sector in the country which is still missing in India’s legislative framework. Although the draft for such a law was proposed in 2015 but was not implemented. The Country’s Renewable Energy Law provides for “Mandatory Connection Policy”, which is one of the most significant provisions under the law, which essentially requires China’s grid corporations to interconnect the energy produced through renewables to the grid and ensure the procurement of all the electricity created by approved RE producers situated in their respective areas. Further there are two specific central regulations executing this provision which are: NDRC “Regulation on the Administration of Power Generation from Renewable Energy” and the SERC “Measures on Supervision and Administration of Grid Enterprises in the Purchase of Renewable Energy Power.” Further law makes this provision more effective by providing legal sanctions in case of failure to accomplish the responsibilities.

Article 29 of the law states that “if a power grid corporation fails to purchase the entire quantity of power generated with renewable energy, thus causing economic losses to the enterprise generating power with such energy, the grid corporation in fault shall bear the responsibility for compensation, and the power regulatory institution of the State shall order it to rectify within a time limit; if it refuses to make corrections as required, then grid corporation shall be imposed a fine not beyond the sum of the total losses suffered by the particular power corporation”. Also amendments in 2009 to the Art 29 made the penalties more severe, it provides that the power producing enterprises suffering the loss due to non –purchase of the electricity will be compensated twice of their economic losses. Where as in India similar provision is adopted through a “Renewable Energy Purchase Mechanism” which is just a policy initiative and is not mandatory in nature. The mechanism is suffering from number of issues such as no-compliance of RPO targets by State agencies, different targets at state levels, improper monitoring and enforcing mechanism. All these issues can be addressed by including similar provision under “*Electricity Act, 2003”* or in a separate law for regulating Renewable energy sector as enacted by the China.

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