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# A Review on the Impact of Renewable Energy Policies on Solar and Hybrid Sector

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**Abstract:** *Electricity consumption is one of the most important indices that decide the development of the nation. India has emerged as the country which has a huge scope of renewable energy. Hence it is important to have a favorable regulatory framework to promote renewables. Electricity is majorly powered by fossil fuel, and it does contribute to the problem of global warming which is why India is committed to decreasing the share of fossil fuel-based power generation by 40% by 2030.*

*Indian policymakers initiated several reforms in the power sector to meet these objectives. A major turning point in electricity reforms was the Electricity Act 2003 which mandated the SERC to promote RE specific targets. These targets set by SERC known as Renewable Purchase obligations (RPO), mandate DISCOMS and other obligated entities like open access and captive consumers to procure electricity consumption through RE.*

*The next push for renewables, especially for solar, came from the National Action Plan on climate change (NAPCC). As part of NAPCC, the Jawaharlal Nehru National Solar Mission (JNNSM) was launched in 2010 with the target of 20 GW installed solar capacity till 2022.*

*In 2014, a revised solar mission was introduced with a target of 100 GW of solar installation by 2022. The latest revision in the target involves installing 50 GW of floating solar in addition to the 100 GW target.*

*With these ambitious targets laid down by the government of India, it will require a strong regulatory framework. In initial stages to attract more investors in the solar industry, GoI had taken initiatives such as custom duty exemptions, tax benefits, Tax Holiday, Accelerated Depreciation. Benefiting from these policies the cumulative solar installations in India has reached 26 GW at the end of September 2018.*

*However, policies for renewable have evolved over time. The ongoing issues such as ambiguities in applicable GST rates, safeguard duties applicable to the import of solar panels from China, volatility in lending rates are affecting the financial viability of solar projects. Another challenge the solar industry is hovering with is constantly dipping solar tariffs due to competitive bidding framework. It is necessary to have certainty in policies to bring stability in this sector, and the amendment in the electricity act is the first step towards it.*

**Keywords:** *Renewable energy policies, solar, hybrid power, RPO and REC.*

## I. INTRODUCTION

India has emerged as the second largest nation in the world for clean energy investment and a remarkable player in the renewable energy sector over the years. The promotion of renewable sources supports the government agenda of clean energy while emerging as one of the solutions for the supply of electricity in rural areas. [1]

After the two oil shocks witnessed by India in the 1970s, the country felt the need to be energy sufficient and make renewable energy the major driver of change in India. In 1981, Commission for Additional Sources of Energy (CASE) came into existence which was later renamed as Ministry of New and Renewable Energy (MNRE), 2006. The ministry had the mission to be energy secure and increase the share of renewables in the country. It also focussed on affordable electricity and electricity for all. [2]

The major legal reform which brought a new paradigm shift in the Renewable energy sector was the Electricity Act of 2003. It aimed to increase private participation in this sector by de-licensing the generation, facilitating non-discriminatory open access and introducing power trading. The Act mandated the promotion of renewable energy sources in India. It aimed at 24X7 electricity for all and the promotion of efficient and environmentally friendly policies.[1]

Under section 3(1) of the Electricity Act, 2003 the National Electricity Policy (NEP) was formulated with the consultation from Central Electricity Authority (CEA). The objective of the NEP is to “is the supply of reliable and quality power of specified standards efficiently and at reasonable rates” [3]. This policy introduces the term of Renewable Purchase Obligation where the purchase of power through non-conventional sources is required to increase. [4]

NEP advised SERC to come up with preferential tariffs known as Feed-in Tariffs (FITs) for the upliftment of the renewable energy sector. The FIT is a policy mechanism designed to make the renewable sector more lucrative for the private players in which RE tariffs were set with appropriate differential with respect to conventional. This continued until they became competitive with the conventional sources. [5]

“The Central Government notified the Tariff Policy on 6th January 2006 under Electricity Act, 2003”. The tariff policy recommended SERC to fix RPO depending on the availability of RE resources in the respective region. NTP also advised SERCs to take into account technology and state yearly resource availability to set preferential tariffs (FITs). [6]

The Rural Electrification Policy, 2006 notified by the central government in compliance of the Electricity Act 2003, aims at electrification in all un-electrified areas and supports Decentralized distributed generation or Standalone system to electrify villages where grid connectivity is not feasible. To achieve the goals of the policy the Central Government has reviewed the existing rural electrification schemes and has launched Rajeev Gandhi Grameen Vidyutikaan Yojana (RGGVY).[7]

The next initiative accelerated the growth of renewables, especially for solar, came from the National Plan on Climate Change (NAPCC). NAPCC suggested a RE target of 5% of electricity generation in 2009-10 and reaching 15% by 2020 with an increment of 1% every year. This action plan introduced as the “Jawaharlal Nehru National Solar Mission”. [8]

JNNSM was launched with a target of 20 GW by 2022 for grid-connected and solar rooftop projects. Over the years the solar sector has seen massive development about technology and performance. This is evident by the fact that India achieved its 20GW milestone four years ahead of its schedule. This achievement has pushed the Government of India to scale up the solar target from 20Gw to 100 GW by 2022. [9]

## II. OBJECTIVE

The objective is to identify the impacts of key policies and regulations affecting the solar and hybrid industry. The study will also focus on the current trends, opportunities, and challenges that lie ahead in the years to come.

## III. METHODOLOGY

The methodology is based on secondary research only where information about the current solar and hybrid sector in India is collected and analyzing it with future predictions. This is carried out by identifying the key policies, regulations and CERC orders which will impact the solar and hybrid industry.

## IV. CHALLENGES OBSERVED IN RENEWABLE PURCHASE OBLIGATION (RPO) FRAMEWORK

### A. *The Mismatch Between State And National Renewable Targets*

To create a market for renewables, “National Action Plan on Climate Change (NAPCC)” in 2008 set the renewable energy target of 15% RE by 2020, 100 GW of solar power and 60 GW of wind by 2022. Additionally Ministry of Power (MOP) prescribed 10.25 % of non-solar RPO and 6.25% of solar RPO by 2018. [10]

However, the responsibility of setting up the RPO targets and implementation is on the respective state regulator. After the enactment of the Electricity act, each SERC notified individual RPO targets as per their state regulations. These state targets failed to match up with the national target in accordance with the NAPCC. This mismatch is assumed considering the renewable energy generation capacity and adverse financial condition of DISCOMS in each state.[11]

According to the states progress report on RPO targets, FY 2015-16 published by MNRE shows that due to a deficit in solar power installed capacity many states have failed to meet its solar RPO compliance. The states like Karnataka, Meghalaya, Himachal Pradesh, Gujarat and Rajasthan achieved above 60% of RPO compliance. All the remaining states failed to achieve RPO compliance above 60%. Based on this current scenario additional solar capacity of 2000 MW is needed to fulfill the solar RPO.

### B. *Enforceability of RPO*

One of the issues which have restrained the growth of the solar industry is the approach towards the solar RPO compliance in each state. Secondly, due to the absence of updated data with no track of compliance data is adding to the lack of accountability of the obligated entities. Due to weak RPO compliance verification mechanism followed by the state regulators, the obligated entities get an opportunity to defer their RPO target. As there are no penalty provisions carved out by the SERC for the obligated entities in case of noncompliance. It is inspected that states are lagging in meeting their RPO targets from last five years. Most of the states have failed to issue solar specific policies.



### C. Financially Distressed DISCOMs

India's shift from thermal based power to nonconventional sources lies with the purchasing power of the state distribution companies. It is evident that the largest purchasers of electricity are the state electricity utilities. They are even responsible for the purchase of additional renewable energy sources. However, DISCOMs are currently under long-standing financial stress. It has become difficult for DISCOMs to procure renewable power as they are finding RE sources expensive than conventional sources. Secondly, due to a wide gap between the procurement cost and supply cost of the power, DISCOMs are less enthusiastic about the RPO mechanism. [11]

### D. Renewable Energy Certificate (REC)

The policies under the Electricity Act and NAPCC solar mission provided a plan of action to boost the renewable energy sector and ensure that renewable energy has a larger contribution to the energy mix of the country. Given the fact that the availability of RE sources varies from state to state, this inhibits the state regulator from specifying high renewable purchase obligation that does not have substantial energy potential. As there was no framework which will support the inter-state sale of renewable energy and the limitations in existing RPO mechanism was hindering the further growth of renewables in the country.

Hence to bridge the gap between availability and requirement of renewable energy sources and meet the targets of RPO the concept of Renewable Energy Certificate (REC) came into existence. REC mechanism gave a boost to the renewable energy market and paved the way for renewable purchase obligations compliance. [12]

The certificates issued were categorized into two types: Solar and Non-Solar depending upon their source of generation. These RECs were then allowed to be traded on the exchanges (namely IEX or PXIL). The trading would happen between generators and obligated entities RECs are treated.

### E. Concerns in REC Mechanism

1) *High Solar REC trading Prices:* The CERC discovers the price bandwidths of solar and nonsolar REC. REC trading prices have been revised many times depending on the cost of technology and generation. However, from the last few years, the price of a solar module has come down drastically, but this has not been reflected on the solar REC trading prices. [13]

### F. Impact on Solar Industry

1) *Revision of Targets:* One of the current issues which are affecting the solar industry is that many states are revising the existing solar RPO targets due to nonavailability of solar power. As state commission like Uttar Pradesh, Rajasthan, Gujarat are allowing DISCOMs and other obligated entities to meet the deficit capacity by nonsolar RPO. Due to the shortfall of solar capacity, Electricity Regulatory Commission of Rajasthan and Gujarat has recently revised the state renewable purchase obligation for the financial year 2018-19. In the newly amended regulations, RERC has notified solar RPO of 4.75% from the previous target of 6.75%. RERC is looking forward to meet its RPO target by procuring additional nonsolar renewable sources. [14] Some of the states are reducing the state targets depending on the financial feasibility of the DISCOMs. This affects the business opportunities of the developers.

2) *Increase in REC Inventory:* Under the Electricity act, SERC has mandated all the obligated entities to comply with the RPO targets. Obligated entities have the choice to comply with RPO target either by procuring RE sources from power producer or through the purchase of renewable energy certificates (REC). As there is no penalty provision for noncompliance of RPO target many states are not purchasing the Renewable energy certificates. [15]

3) *The Threat To Financial Viability Of Renewable Power Producer:* Some states have mandated RPOs for their obligated entities. This has forced them to buy power from renewables. Wind developers issued a petition to MERC as they were not paid. MERC then issued a common order to clear all outstanding dues at the earliest. In addition, the following non-operation from the DISCOMS for open access developer in a state like Haryana has further aggravated the situation.

### G. Opportunities

Recently Ministry of power (MOP) announced a renewed RPO trajectory for solar and non-solar for a 3-year period (2019-20 to 2021-2022) to help SERC in the implementation of RPO targets.

### H. Recommendations for Better Functioning of RPO Mechanism

During the inception of Renewable Power Obligation, it was envisioned that it will boost the renewable energy sector as the obligated entities will have to purchase power from renewable sources like solar and wind. It was just a policy initiative and not

mandated in the Act which did not make it compulsory for the obligated entities to oblige towards it. With the implementation of The Electricity Act, 2003 in 2017, it has been mandated to comply with RPO for all obligated entity. It is critical for this clause of the Act to be passed in the amendment if RPO market wants to see daylight and come out from the darkness it has been into. [16] The government's strong push by mandating it will force the State Commissions to enforce penalty on defaulters and the RPO will be a useful tool as it was envisioned for.

#### *I. National Tariff Policy, 2006*

Clause 3 of the Electricity Act, 2003 mandated formulation of the National Tariff Policy and the National Electricity Policy. In line with this, the National Tariff Policy was formulated and notified in January 2006. This policy highlights the measures for increasing competition and efficiency of operations along with improving the quality of supply in various segments. National Tariff Policy promotes renewables by recognizing the need for preferential tariffs and also mentions the potential of hydropower and the need to exploit it. The policy discourages free electricity and calls for limiting the provision of subsidized electricity. [17] [18]

##### *1) Opportunities created by the National Tariff Policy 2016*

- a) The impact of changes in domestic charges such as duties, levies, cess and taxes can be passed on to the consumer. This encourages the power generators to install more power plants
- b) With RPO target set at 8%, it is inevitable that the Renewable Energy sector will grow and that can be seen with the current solar and wind installations happening in 2019.
- c) Better investment opportunities for micro-grid operators with the provision of protecting their investments and incentives provided
- d) Some clauses are intended at improving the power supply and other at recovering the cost of power companies which is a boost for power companies
- e) Smart meter manufacturers and other ancillary units got a boost with the announcement of making smart meters mandatory
- f) Competitive Bidding ensured that the prices of wind and solar reach at an all-time low making renewable energy affordable than coal.
- g) As electricity can be traded in the spot market at IEX or PXIL, it improves the health of the power plants as their PLF numbers improve.
- h) Encouragement to Open Access with rational and transparent cross subsidy calculations

#### *J. National Wind Solar Hybrid Policy, 2018 - Opportunities and Impacts on the India Renewable Energy Sector*

The draft of the National Wind Solar Hybrid Policy was issued in June 2016. After welcoming comments and making certain changes, the "Ministry of New and Renewable Energy (MNRE)" came up with the "National Wind Solar Hybrid Policy on 14<sup>th</sup> May 2018".

The government understood the fact that solar and wind are complementary resources which can help in increasing utilization of infrastructures such as land and transmission system. It also would help to achieve better grid stability. This prompted the government to lay down this hybrid policy to encourage and exploit the potential of hybrid plants in India. [19]

Although Policy is a guiding document and not binding by law, it gives a clear vision of what to expect in the future. The businesses can extract business opportunities and also seek caution on some aspects that come out of the policy. [20]

##### *1) Business Opportunities generated by National Wind Solar Hybrid Policy, 2018*

- a) The policy recommends the use of battery storage capacity to smoothen the irregularities generated by hybrid plants. Mentioning this fact gives us an insight into the government's vision of promoting battery storage in the future. This is a good sign for the companies who are willing to or have started to invest in battery storage technology. Clause 5.4 states the above fact and also states the possibilities of hybrid projects coming up with battery storage giving opportunities to this segment.
- b) Increase in generation number due to higher utilization of natural resources for approximately 14 hours (10:00 AM to 03:00 PM for solar and 02:00 PM to 02:00 AM for wind) can ensure high generation number resulting in better IRR.
- c) Optimum utilization of transmission infrastructure will ensure increased efficiency and reduction in losses which prompts higher revenue possibilities
- d) Clause 5.2 of the policy states that hybrid projects can be used for fulfilling the solar and non-solar RPOs. This can encourage the building of new projects by private companies as they can have good opportunities to sell power to obliged consumers.

Moreover, it can also increase the possibilities of captive projects which can reduce the uncertainty of markets for the obliged consumers in the long term

- e) Encouraging the Wind Turbine Generating (WTG)/ solar plants developing companies to install wind turbines/ solar panels at existing solar or wind sites by ensuring no additional connectivity charges. This can boost sales of wind developers as they try to push in turbines in existing sites
- f) The government has agreed to lend support to the technology and development projects about hybrid systems. This is a welcome sign for the Research & Development (R&D) departments of many firms and will ensure faster innovation and development in this sector.
- g) The government has also mentioned the support that will be provided for developing of standards for hybrid policy. A business opportunity which some of the renowned standards developers would be interested.
- h) Collection of wind and solar data for sites will need to be accurate for the installation of hybrid projects. This will generate business opportunities for companies working in this domain

#### K. *Impacts and Challenges of National Wind Solar Hybrid Policy, 2018*

- 1) The Hybrid policy will ensure more players participating in setting up of hybrid parks. This was not seen earlier to this policy. Also, this is a flexible policy where there is no restriction for either the wind or solar developer. This can help boost both industries
- 2) With optimum utilization of land, transmission infrastructure and proper Central and State regulations, the cost of renewable energy in India can reduce even further ensuring the increase of renewables in the energy mix of the country.
- 3) There are some practical difficulties that need to be addressed when one goes through the policy. The procurement of land is the most severe challenge that wind developers face and this policy fails to address it. It also fails to address the proportion of wind and solar that can be installed at a particular site. Although, it is likely that solar and non-solar RPOs will be boosted, the current issues about them need to be resolved
- 4) It is to be seen how well this policy is taken up by the State governments as they play a crucial role in the implementation phase. For example, the Gujarat hybrid solar-wind energy policy has exempted the energy charges from hybrid projects along with a concession of 50% for captive consumption users. This will help boost hybrid in a state having one of the highest potentials of hybrids. Similarly, other states must follow suit in encouraging investments.

## V. CONCLUSIONS

The Solar sector has seen many policies and reforms which has benefited India positively to grow from a 2 GW solar capacity to a 25 GW solar capacity. With new technology, there will always be a bottleneck involved in terms of regulations and infrastructure. Some policies such as safeguard duty and RPO may not have gone well with the developers in the short term, but taking a broader horizon, these steps will be considered pivotal in the success story on renewable energy that the country is embarking on.

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