

Future of Coal based power plants in India

Is Renewable Power is going to be Future for India

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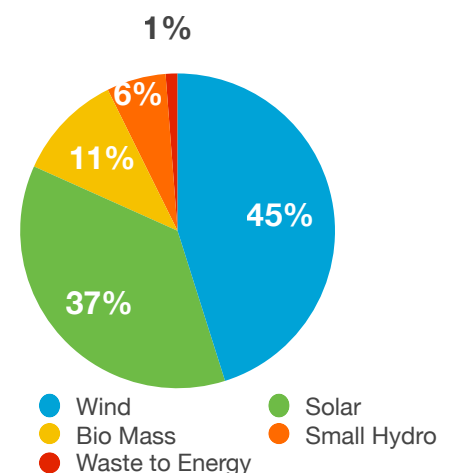
There is debate on the issue of coal being used as a fuel to the power plants on a long term basis or survival of coal based thermal power plants. The debate is furthered due to Climate Change. Govt. of India committed that *“In recognition of the growing problem of Climate Change, India declared a voluntary goal of reducing the emissions intensity of its GDP by 20–25%, over 2005 levels, by 2020, despite having no binding mitigation obligations as per the Convention”.*



This resulted into one of the largest renewable energy (RES) capacity expansion programs in the world by India to achieve 175 GW by the year 2022.

Between 2002 and 2015, the share of renewable grid capacity has increased over 6 times, from 2% (3.9 GW) to around 13% (36GW). This momentum of a tenfold increase in the previous decade is to be significantly scaled up with the aim to achieve 175 GW (100 MW for Solar & 60 MW for Wind) renewable energy capacity in the next few years. Renewable Energy consists of Wind, Solar, Small Hydro & Bio mass. As per CEA recent July 2019 data¹, a total installed renewable energy has reached to a level of 80GW out of which the major contributors are 37MW (45%) Wind power and 30 GW (37%) solar power. Solar share in Renewable power is increasing substantially on year to year basis. It is remarkable achievement in the country, a leapfrog jump to achieve the set target. The recent tenders for solar were quoted in the range of ~Rs 2.8/kWh has perfectly defeated the

Renewable- Installed Capacity in India as on July 2019 - Total 80GW



¹ CEA July 2019 report

Both Thermal power and Renewable (Wind & Solar) are going to co-exist.

Renewable power cost will be dependent on Battery Storage Energy System to compete with the Thermal Power.

Coal is available in abundance in India offering still cheaper option & base load, will always compete & challenge with Renewable power development on prices.



argument as solar being an expansive power. This makes a case for further development of Solar power in India. Like-wise wind tariffs are also plummeting after the implementation of competitive tariff regime. This all culminating into a very strong case for the Renewable power. However, there are some challenges as well due to non-availability renewable power continuously. Wind is available in the specified months of the year and solar has night time limitation resulting into the requirement of the base load and energy storage.

Despite² these prevalent challenges, energy storage as an innovative solution is increasingly being sought globally to meet the emerging requirements of the developed as well as the developing nations. Installation of battery storage energy system (BESS) is increasing dramatically as energy markets are being transformed to allow for the use of more diversified resources. Reports that are generally available forecast that the global BESS market is expected to exceed more than \$9 billion by 2024 at a compound annual growth rate of 34 per cent. BESS are crucial for enabling the effective integration of renewable energy and unlocking the advantages of local generation and a clean, robust energy supply, with value being demonstrated to grid operators for management of the variable generation of renewable energy. With India aiming to set up 175 gigawatt (GW) of renewable energy capacity by 2022, deploying BESS will only aid network operators, mitigate renewable resources' variability, and reduce congestion on the grid. The growing renewable power capacity clubbed with appealing business for electric vehicles will strengthen the rationale behind BESS. Recent amendments brought about by CERC in the 'Connectivity Regulations' and the inauguration of the first grid-connected BESS have drawn the attention of industry to energy storage systems in India and their imperative role in the Indian context. Initial steps have also been initiated by certain state governments to develop storage capacities. Given the immense potential in the energy storage sector and its perfect integration with the growth of renewable energy sector, it may be apt to quote a Forbes news report which states, "Cheap batteries mean that wind and solar will increasingly be able to run when the wind isn't blowing and the sun isn't shining".

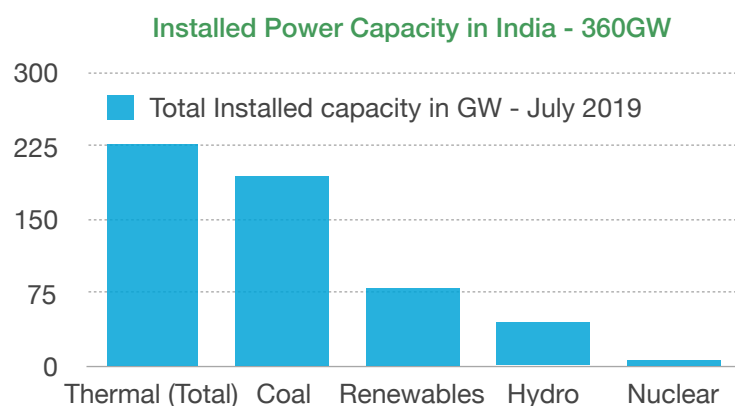
² energyworld.com

Battery storage³ is a key determinant of the inflexion point. Battery storage cost has reduced substantially from over USD1,000 per kWh to about USD250 per kWh over the last few years. With increasing supply and advances in technology, battery cost is expected to go down further to approximately USD50 per kWh by 2030 for solar power of Rs 5.5/kWh. This may have significant implications on coal-fired power plants in terms of replacing the thermal capacity required to meet the peak demand. Dominant Renewable power (with 40% share in the power mix) driven country Germany has Renewable power (Wind & Solar mix) around 35 Euro/MWh⁴ against Indian average power cost of 6 to 8 cents/kWh.

As a part of decentralised development of Renewable (Solar) power, the Government of India has launched a new scheme named KUSUM (Kisan Urja Suraksha evam Uhaan Mahaabhiyan) to subsidise the farmers with solar irrigation pumps (SIPs) in their farms. Under this scheme, 03 components have been proposed. Component A will aim for 10GW development with Grid supply & shall be setup by farmers/cooperatives/panchayats/developers. DISCOM shall provide the financial support @ Rs. 0.40 per unit or Rs. 6.6 lakh per MW with PPA for 25 years. Component B & C with 16GW shall be for standalone pumps with 60% subsidy to a farmer for setting up of pump sets and tube wells on their land including the option to sell surplus power to Grid. This decentralised development mainly aims to develop localised power thereby reducing the load on storage & grid. The present phase is embarked with an aim to develop 26GW by 2022.

But, from Indian perspective, it remains to be seen to achieve a lower battery storage cost for the grid integration a success or not and, If the total cost after the grid integration costs make a commercial case for Renewable power against the coal based thermal power? The argument is that post grid integration/management, the solar power is going to be competitive alternative to coal based thermal power. How do we see the ground realities in India more so keeping in mind factors like growing population with aspirations, sensitivities on power tariff, developing nation, growing GDP and government focus to have 100 percent power to each household.

The latest data published by CEA report - July 2019, shows that India has a total power installed capacity of 360 GW. Out of total thermal power capacity of 227GW, coal has a giant share of 196GW with 25GW of Gas. Due to non-availability of Gas at feasible prices, most of the gas based thermal power plant are witnessing a very low tariff or closure in turn not seeing any further development in gas based power plants in India. In other words, Thermal power capacity will dominantly be of coal fired power



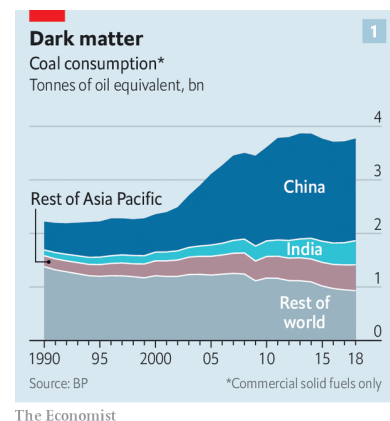
³ US Department of Energy, and secondary reports, KPMG analysis, Coal Vision 2030

⁴ https://www.energy-charts.de/price_scatter.htm?source=priceVSWindSolar&year=2019

stations. This is also due to the abundance of coal reserves in India. Another important aspect needs a consideration is the total generation from various sources. On the analysis of last financial year ie 2018-19 as per CEA report Mar 2019⁵, the total power generation from other than Renewable source was 1249 Billion Units (BU) & Renewable power was 117 BU with a total generation of 1366 BU. This means the share of power generation from Renewables sources being just 9% against the total renewable power capacity share of over 20% against the generation from other sources being more than 90% with installed capacity around 80%. This goes to the point if renewable power is going to replace thermal power or going to co-exist with increasing share ?

India is blessed with the Coal Resources over 300 billion tonnes. Out of which more than 80% is thermal coal (used for power & other sectors other than steel). Coal India (CIL) & Singreni Colliery (SCCL) are the two major state owned players with the last financial year ie 2018-19 producing 670 million tonnes. New allotment & auction of coal mines as per Coal Mine Special Provision Act is additionally producing around 50 million tonnes. 05 years of the Coal production is growing at the rate of 4-5%. Coal India is targeting to reach for 900 million tpa of coal production capacity in next couple of years to reduce the coal import dependency and to gear up to the long term coal demand of India. Additionally, private/state sector⁷, who have got the mines through auction or allotments post coal blocks deallocation, efforts will also come into production thereby supporting the overall country's coal production on a long term basis. However, Indian coal Demand is increasing more than being supplied domestically which is pushing for increasing import. Last financial year 2018-19 Indian coal import reached to around 200 million tonnes higher than by ~20 million tonnes for previous financial year.

Coal Imports are faced with various issues like price volatility, uncertainties and evacuation challenges though. Out of the the total world-wide seaborne⁶ thermal coal demand/supply forecast of 1063 Million tonnes in year 2020, the main producing countries (supply) are Indonesia (425 million t), Australia (220 Million t), South Africa & Columbia with ~80 million t each and Russia around 180 million t whereas the consuming countries (Demand) are India (200 million t), North east Asia (315 million t), South east Asia (116 million t), China 217 million t & Europe around 119 million t meaning that Asia (including China) are consuming more than 80% of global demand of the thermal coal with China consuming more than 50% of world production - see the adjacent graph. Although the coal based power share in China energy mix is decreasing but the recent the Belt and Road Initiative by China, a big Chinese infrastructure-development scheme⁷, will see billions spent to build coal-fired plants in Bangladesh, Indonesia, Pakistan and Vietnam, among



⁵ CEA report - March 2019

⁶ Argus Seaborne Thermal Coal Outlook 2019

⁷ Economist August 2019

other countries. Chinese financial institutions are helping to fund more than a quarter of coal-fired power stations under development around the world leading to further coal demand.

On the Demand side⁸, Overall Indian coal demand is estimated to be **900–1,100MTPA by 2020 and 1,300–1,900MTPA by 2030**. The demand scenario is influenced by economic growth, energy efficiency and emergence of alternate coal uses. By 2030, of the overall coal demand, **thermal coal demand is estimated to be 1,150–1,750MTPA** and the balance is coking coal demand. While this appears to be a very wide range, the nature of uncertainties in the ecosystem are also quite wide. The upper end of the spectrum of the coal demand corresponds to a GDP growth rate of 8 per cent. The lower end of the spectrum of the coal demand corresponds to an energy efficient scenario. While the recent quarterly estimates of the GDP are lower, it is believed that this is a result of the recent discontinuities like demonetisation and GST transition. As the positive impact of these changes start to pan out, it is expected that by next year, the GDP may improve to 7 per cent. Power sector is largest consumer of the coal in India. Presently, coal contributes close to 55% to the total power production with close to around 930 MTPA of coal consumption. According to BP Outlook 2019⁹, coal's share in India's primary energy consumption will decline from 56% in 2017 to 48% in 2040. But that is still nearly half of the total energy mix and way ahead of any other source of energy. Oil's share, the second largest, will decline from 29% to 23%, and the contribution of renewables will rise fivefold to 16%. The NITI Aayog report¹⁰, the Electricity Mix - total coal based generation installed capacity is projected as 264GW in year 2030 (47%) and renewables as 31% (with solar as 12% share and Wind 17% share) out of total demand of 562GW. Whereas the projected power generation in year 2030, the share of Renewable power is around 15% (presently around 9%) compare to thermal power generation of 71% (presently 90%).

To summarise, the Renewable power (ie Solar & Wind) is going to co-exist with the thermal power (mainly coal based). Based on the above analysis, it is evident that coal based thermal power story is going to stay in India and this is due to the fact of coal availability in abundance at a low price. It seems that Renewable power is not going to replace Thermal power completely or say dominantly. However, in the Electricity mix, Renewable share will continue to grow and coal based Thermal power share will decrease but still Coal based thermal power will have majority share.

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⁸ Coal Vision 2030

⁹ BP Outlook 2019

¹⁰ A Report On Energy Efficiency And Energy Mix In The Indian Energy System (2030), using India energy scenarios 2047