

ISEP WORKSHOP BRIEF

Year 2020 / Issue 1

24X7 POWER SUPPLY TO ALL IS ACHIEVABLE

- R.V. Shahi, Chairman of Energy Infratech Private Limited, Former Power Secretary (Government of India)

This brief highlights India’s huge potential to achieve round the clock electricity availability to all its population. Renewables combined with massive coal reserves can produce surplus generation capacity but the only bottleneck to 24x7 power supply is adequacy in fuel supply and the institutional infrastructure and commercial management of distribution companies.

When the NDA Government came to power in 2014, one of the thrust areas in infrastructure space, which was emphasized, was uninterrupted power supply (24X7) to all. As we know, power sector continued to be a major constraint all through in the twentieth century. Although during the period 1980 to 2000, Government programs of developing new power generation capacity did receive a major push, mainly through Central Government organizations like NTPC, even until as late as the year 2000, the country could achieve only about 96,000 MW of power generation capacity.

Indian Power Sector in the year 2000

SECTOR	MW	
State Sector	58,777	(61%)
Central Sector	29,062	(30%)
Private Sector	8,427	(9%)
Total	96,260	(100%)

Table 1: Sector wise Power generation potential

	MW	
Hydro	23,527	(24.4%)
Coal	59,187	(61.5%)
Gas	9,559	(9.9%)
Diesel	728	(0.8%)
Nuclear	2,240	(2.3%)
Wind	1,024	(1.1%)
Total	96,260	(100%)

Table 2 : Resource-wise Power generation potential

Availability of power continued to be a critical factor with peak deficit as high as over 20 percent of demand. The per capita consumption in the year 2000 was hardly 355 KWh per head per year

and that too with large variations across different regions – the East and North East lagging far behind.

Per Capita Consumption in the Year 2000	
North	318
West	535
South	400
East	192
North East	103
Overall	355

Table 3: Per capita consumption in year 2000

In the twenty first century, after the implementation of new legislation, viz. Electricity Act 2003, and several associated policy instruments – National Electricity Policy, Tariff Policy, etc. – the Power Sector witnessed a highly accelerated growth in power generation and transmission infrastructure. Table 4 presents the profile of total installed capacity of India as on November, 2019. The installed capacity has increased from about 96,000 MW in January, 2000 to 3,66,000 MW in November, 2019, almost a four-fold increase. Further, the per capita consumption has increased from 355 KWh to about 1,200 KWh at present. During this period (2000-2019), proportion of private sector generation capacity has increased from 9% to 46.6%. While the Hydropower capacity reduced from 24.4% to 12.6%, the renewables increased from just 1.1% to 23.1%. While these achievements, by any standard, are highly satisfying, India has to move forward further to catch up with developed nations. It would be relevant to mention that global average per capita consumption is of the order of 2,700 KWh, China has achieved close to 3,500 KWh and a number of developed countries have much higher levels of per capita consumption.

Sector	MW	% of Total
Central Sector	91,497	25.2%
State Sector	103,815	28.5%

Private Sector	170,668	46.6%
Total	3,65,981	

Fuel	MW	% of Total
Total Thermal	2,29,401	62.7%
Coal	1,97,695	54.2%
Lignite	6,260	1.7%
Gas	24,937	6.9%
Diesel	510	0.1%
Hydro (Renewable)	45,399	12.6%
Nuclear	6,780	1.9%
RES* (MNRE)	84,400	23.1%
Total	365,981	100%
*Renewables include 37,279 MW (Wind), 32528 MW (Solar), 4,648 MW (Small Hydro), 9,806 MW (Biomass), 140 MW (Waste to Power).		

Table 4: Total Installed Capacity (As on 30.11.2019)

Source: Central Electricity Authority (CEA)

As reflected in the power sector profile above, the total installed capacity is of the order of 366,000 MW. However, normally the peak power generation and supply is only of the order of 180,000 MW, which means less than 50% of the installed capacity is asked to generate. There are a number of factors which stand in the way to use the unutilized power generation capacity and take power to customers. These constraints emanate from inadequacies in management of fuel sector, distribution infrastructure, and, above all, in management of power distribution business itself. There appears to be an approach among many State Government controlled distribution utilities that the more they will ask the power generating units to produce, the more the distribution utilities would need to purchase and supply to consumers, the more will be their financial losses. Therefore, the way distribution utilities are managed, including their

existing institutional framework, besides partly also the inadequacies of fuel sector, primarily stand in the way of achieving, in reality, a well achievable vision and promise of 24X7 Power to All. Ability of power generation sector and ability of high voltage power transmission sector are such that they can definitely fulfill implementation of this commitment. But this is possible only if fuel sector on one hand, and distribution management on the other could stand up and take this challenge.

In the year 2000, distribution infrastructure, and more particularly rural distribution infrastructure were completely inadequate to even think of a vision like 24X7 Power Supply. As per census 2000, as much as 60% of rural households in the country had no connectivity and access to electricity – in as many as six states, 80 to 95% of rural households did not have access to electricity. Two important programmes of the Government of India – i) Accelerated Power Development Program for urban area, and ii) Rural Electrification Program for villages were launched during the period from 2002 to 2005, with sufficiently large budget outlays. Both these programs were regularly strengthened by successive central governments to ensure creation of adequate distribution infrastructure in urban as well as rural areas. The present NDA Government further strengthened these Schemes named as Integrated Power Development Scheme (for urban areas) and Deen Dayal Upadhyay Grameen Vidyutikaran Yojna (for villages). These efforts, over the years, have led to a situation of distribution infrastructure not being a bottleneck or constraint for power to all. It is the institutional framework and commercial management of distribution which, established beyond doubt, is standing in the way, in a number of states, for achieving the vision of 24X7 Power Supply to All. In many cases, the state owned distribution companies are financially so stressed, primarily on account of poor distribution management, that they are unable to pay to the generation companies. They do not prefer to buy power but prefer load shedding instead, thereby completely defeating the ambition of 24X7 Power Supply. States like Assam, Bihar, Haryana, Jharkhand, Karnataka, and Uttar Pradesh supply power to the rural areas for durations varying between 17 to 20 hours in a day. This is as per the Press Information Bureau (PIB) Report of 21st November, 2019 for power supply during September, 2019. Many of those states which supply longer hours are faced with huge financial losses. According to the report of the Economic Times, quoting PTI on October 2, 2019, the outstanding dues by distribution utilities to power producers rose around 57% to INR 78,000 Crores in August, 2019, as compared to the same month last year, reflecting a growing stress in the sector. State Governments need to re-visit the present structural arrangement of distribution business and introduce extensive private sector participation, which has

demonstrated remarkable results in generation and transmission segments, and, in a few cases, even in distribution.

Power sector planning approach is rightly based on balancing the fuel and technology mix in power generation profile of the country. The approach is also aligned to the country’s response to climate change concerns with the objective to progressively shift from fossil fuel centric profile to a profile which encompasses, in a significant way, the renewables such as Solar, Wind, and Bio Mass. Recently, Government of India has categorized all hydro power generation projects as renewables. Government programs aim at massive expansion of Solar and Wind capacities, currently at about 80 GW to 175 GW in next few years. Solar alone is targeted to rise from about 30 GW to 100 GW. Even though these targets appear to be too challenging to be met by the year 2022, the priority of the Government and the thrust with which these programmes are being pursued, we may definitely expect that these targets would be met, if not by the year 2022, then just a few years later.

Technology changes in respect of solar power have brought down the costs, over last five years so drastically that this source of energy is now a preferred option even from the point of view of price of power. At below INR 3 per KWh, Solar Power is more than competitive with almost all other sources of power. Fortunately, there is a huge potential of Solar Power in various parts of the country, of the order of over 700 GW (Refer Table 5). The National Institute for Wind Energy has made estimate for India’s wind power potential. The latest estimate at 100 meters is 302 GW. The states with most capacity of wind power are Tamil Nadu, Gujarat, Karnataka, Maharashtra, and Rajasthan. Obviously, massive capacity of renewables also brings with them the resultant commercial and technical challenges. The technical challenge emanate from managing the grid, because entire solar capacity generation would be unavailable after the sunset, and the task will be how to balance and match the load. Wind power, which is available during nights, is only a part answer to this specific problem. Transmission infrastructure development would require a deeper understanding of technical complexities on one hand, and commercial ramifications of huge capital investments leading to burden on consumers, on the other. It is gratifying that these issues are being deliberated so as to evolve meaningful and most viable strategy.

State Wise Estimated Solar Power Potential	
Total solar power in GWp	748.98 GWp
State	Solar potential

Andhra Pradesh	38.44
Arunachal Pradesh	8.65
Assam	13.76
Bihar	11.20
Chhattisgarh	18.27
Delhi	2.05
Goa	0.88
Gujarat	35.77
Haryana	4.56
Himachal Pradesh	33.84
Jammu & Kashmir	111.05
Jharkhand	18.18
Karnataka	24.70
Kerala	6.11
Madhya Pradesh	61.66
Maharashtra	64.22
Manipur	10.63
Meghalaya	5.86
Mizoram	9.09
Nagaland	7.29
Odisha	25.78
Punjab	2.81
Rajasthan	142.31
Sikkim	4.94
Tamil Nadu	17.67
Telangana	20.41
Tripura	2.08
Uttar Pradesh	22.83
Uttarakhand	16.80

Table 5: State wise estimated solar power potential

India has huge coal reserves of the order of 320 billion tonnes. Jharkhand, Orissa, and Chhattisgarh, account for almost 80% of all the reserves. Other States having significant reserves include West Bengal, Madhya Pradesh, Telangana, and Maharashtra (Refer Table 6). At present, with over 60% coal based power generation capacity, and more than 70% power generation from coal, the profile is largely fossil fuel centric. It is evident that in the next few years the power sector generation profile will undergo major change, which will substantially reduce the proportion of fossil fuel based power replaced by renewables. Yet, it would be safe to assume

that, for at least couple of decades, if not more, coal will continue to play a dominant role in power generation profile, though not in capacity profile. Capacity addition program would obviously not witness an accelerating curve, as in the past, yet capacity addition, though at a much slower pace, cannot be ruled out. This would, therefore, continue to place burden on the coal sector which urgently needs to be set right. It was heartening that no sooner than the new NDA Government came to power, an ordinance on coal sector was notified, which was converted into an Act in early 2015. One of the objectives was to introduce far reaching reforms in the coal sector through several instruments, the most important being the opening up of the coal sector for commercial mining. It was hoped by the industry that commercial mining will lead to a large domestic coal market which will grow in a period of three to four years. It is, however, disheartening that the process remained slow. It is receiving attention now and we may hope for a quicker action.

Coal Reserves

State	Proved	Indicated	Inferred	Total
Total	148787	139164	31069	319020
JHARKHAND	45563	31439	6150	83152
ODISHA	37391	34165	7739	79295
CHHATTISGARH	20428	34576	2202	57206
WEST BENGAL	14156	12869	4643	31667
MADHYA PRADESH	11958	12154	3875	27987
TELANGANA	10475	8576	2651	21702
MAHARASHTRA	7178	3074	2048	12299
ANDHRA PRADESH	0	1149	432	1581
BIHAR	161	813	392	1367
UTTAR PRADESH	884	178	0	1062
MEGHALAYA	89	17	471	576
ASSAM	465	57	3	525
NAGALAND	9	0	402	410

SIKKIM	0	58	43	101
ARUNACHAL PRADESH	31	40	19	90
Total	148787	139164	31069	319020

(Capacity in Million tonnes)

Table 6: State wise estimated solar power potential

(Source: Geological Survey of India)

In a country having 320 billion tonnes of coal reserves, and the powerful legislation now already in place, the country continues to import almost 240 million tonnes of coal annually. Power plants in large number continue to struggle the challenge of avoiding stock outs and are run with critical levels of coal stocks – quite often shutting down their power units. As per the monthly summary for November, 2019, issued by Ministry of Coal, as available in their website, during April – November, 2019, Coal India Subsidiaries produced only 330 million tonnes of coal compared to 358 million tonnes during the corresponding period in 2018, which is almost 8% lower. Also, overall coal dispatch during the current year April – November has been 9% less than corresponding period last year. Coal sector, therefore, requires urgent reform actions in the spirit of mandate provided by the Parliament in the legislation of 2015. Delays on this score are creating implications of additional burdens on customers, on foreign exchange requirement, on stranded power project assets with consequence of NPA (Non-Performing Assets) of banks, besides also in non-achievement of the mission of the government for 24X7 Power Supply to All.

In conclusion, Indian consumers deserve 24X7 Power Supply, deserve options to choose their suppliers as mandated by the Electricity Act 2003, but they also have an obligation, which is to desire such a service on the basis of meeting their payment obligations. The Government has set out the objective for uninterrupted power supply. Power can be made available for which generation and transmission infrastructure are adequate. Distribution infrastructures in urban and rural areas have also been put in place. Two major challenges that need to be addressed are adequacy of fuel supply and organizational changes in the management of power distribution. Coal sector reform is overdue just as power distribution sector reform which is equally overdue. If these issues are addressed urgently, the goal is not far away to be achieved.

About ISEP

The Initiative for Sustainable Energy Policy (ISEP) is an interdisciplinary research program that uses cutting-edge social and behavioral science to design, test, and implement better energy policies in emerging economies.

Hosted at the Johns Hopkins School of Advanced International Studies (SAIS), ISEP identifies opportunities for policy reforms that allow emerging economies to achieve human development at minimal economic and environmental costs. The initiative pursues such opportunities both proactively, with continuous policy innovation and bold ideas, and by responding to policymakers' demands and needs in sustained engagement and dialogue.

ISEP Policy Briefs

ISEP policy briefs are short pieces that use high-quality research to derive important and timely insights for policy. They are posted on the ISEP website and distributed through our large network of academics, NGOs and policy-makers around the world. If you are a scholar or policy-maker interested in submitting or reviewing an ISEP policy brief, email ISEP at sais-isep@jhu.edu.

