

Power Sector Development in Assam: An Assessment

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Abstract: With the rapid increase in population growth, along with rapid rise in the pace of urbanization, followed by infrastructure development and industrial growth, there is a considerable increase in electricity demand and consumption in India as a whole. In the total electricity consumption, a sizable part comes from domestic and commercial usage. Therefore, as the growth of a vital input like electricity consumption trends, it helps us set our priorities accordingly. In the present day world, electricity and power generation is of paramount importance. This can be well known by the fact that the Power Department of a country has the ability to propel all round development. At present, the development of a country is not solely defined by its per capita income, but rather by the energy affordability and per capita consumption of energy. This can be very aptly defined by the fact that energy is the lifeline of a nation, in other words energy development of a nation revolves around energy. According to the Central Electricity Authority statistics, North-eastern India hydro-power potential of 63,257 MW, which accounts to about 43% of the country's total assessed hydropower. Assam, a state in North-eastern India, has a capacity to produce 680 MW of hydro power. The paper aims to analyse the power development scenario in the state of Assam along with its developmental process, problems faced and government initiatives for power generation and supply in the state.

Key Words: Power Sector, Electricity Consumption, Central Electricity Authority, Hydro-power potential.

1. INTRODUCTION:

In pursuance of the Indian Electricity Act 2003, and as a part of Assam Power Sector Development Programme, the Government of Assam has segregated the Assam State Electricity Board into three Public Sector enterprises:

- Assam Power Generation Corporation Limited (APGCL)
- Assam Electricity Grid Corporation Limited (AEGCL)
- Assam Power Distribution Company Limited (APDCL)

All these initiatives were taken by the State of Assam in the interest of the stakeholders, namely suppliers, creditors, consumers, shareholders, infrastructure builders and the Government of Assam. However, externally aided projects, rural electrification, accelerated power development and reform programs (APDRP) are still executed under the ASEB. The Assam Power Generation Corporation Limited was set up to monitor power generation in the state since August, 2005. The company is responsible for development of both Thermal and Hydro Power projects to generate electricity to meet the demands within the state.

The installed capacity of APGCL was 376.96 MW as on 31st March 2019. However, generation of power has been much less as indicated in the table below.

Table 1 A: Power generation in thermal power stations in Assam

	Production in 2016-17 (MW)	Production in 2017-18 (MW)	Production in 2018-19 (MW)
Namrup Thermal Power Station	97	97	97
Lakhwa Thermal Power Station	120	105	90
Karbi Langpi Hydro Electric Project	100	100	100
Myntriang Hydro Electric Project	3	3	3

The 18th Electric Power Survey of India was conducted by the Central Electricity Authority (CEA) for forecasting electric energy requirements, electric load and power station bus bars (utilities only) for all states and union territories of India. As per the survey report, the projected energy requirements for Assam will be 8947 MW and the peak electric load will be 1817 MW. To meet this projected peak demand, ASEB has given importance on development of power projects based on coal and natural gas, along with steps taken up on the following:

- Development of new projects on Hydro-power
- Distributed growth of small hydro projects.

- Repair and maintenance of old power stations
- Upgradation of infrastructure related to distribution, reduction of transmission and distribution costs thereby leading to added capacity of 1425 MW.
- Introduction of sub-station automation and reliable communication system with OPGW to reduce system downtime with in turn will help in predictive maintenance.
- Identification and construction of new transmission and transformation network.
- Transmission capacity expansion for evacuation of power from central sector generating stations for distribution network systems, transmission line capacity addition of length 614 km and MUA addition to 1310 MVA.
- To become less dependent on power purchased from other states.

Table 1 B: Long term forecast of electric energy requirements at Power Station Bus Bars in MW

Region	2011-12	2016-17	2021-22
Assam	1257	1817	2534
India	124995	199540	283470

The Assam Power Distribution Company Limited (APDCL) has a vision to be the catalyst for holistic growth of the state of Assam by powering agriculture and industry: lighting homes- urban and rural, and generating internal resources for continuously improving technology and delivering systems to customers’ delight. Its mission is to make Assam Power Distribution Company Limited (APDCL) the pride of Assam with its 15 key strategies to be undertaken to achieve the mission. They are as follows:

- Advance planning for procurement of electricity to cater the consumers according to demand.
- Enhancing the capacity of electrical sub-divisions and distribution networks by investing in infrastructure development.
- Expanding the distribution network to supply power to all villages
- Increasing awareness among consumers about economic use of electricity
- Replacing electro-mechanical meters with electronic meters
- To give emphasis on 100% revenue collection, energy audit and error free billing
- Engagement of franchises to improve the services to the consumers
- To set up vigilance cell to detect unauthorized use of electricity, if any
- Training of employees for consumer friendly behaviour practices
- To setup state of the art customer care centres and carry out customer indexing
- Strong resolve for following and maintaining financial discipline
- Take up proper steps to increase faith among consumers
- Proper planning for an effective HT/LT ratio
- To reduce AT& C losses by augmenting I-Ph lines wherever required
- Installation of underground cables in place of overhead cables as far as possible and feasible.

2. Important Indicators of Power:

2.1 Installation Capacity and Generation of Power

The noticeable feature of installed generation capacity should be higher growth rates, for inclusion of renewable energy sources in comparison to fossil fuels. The installed capacity of generating plants includes coal, hydel and gas plants.

From the point of view of power requirements in general and consumer demand in particular, the status of power generation in Assam has not been satisfactory at all. There has always been a shortage of power supply in the state, due to excess demand in comparison to production. The ASEB has been trying to meet the power shortages and additional requirements by importing power from Central Government and private foreign sources. The installed capacity of various generating plants and generation of power during the last nine years is shown in table 1.

Table 2.1 A: Installed capacity and Generation of Electricity in Assam

Installed capacity of Generation(Plants/MW)		2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Hydel	KLHEP	100	100	100	100	100	100	100	100	100
	M.SHEP St-II					3.0	3.0	3.0	3.0	4.5
Gas	LTPS	120	120	120	120	120	120	120	105	90
	NTPS	97	97	97	97	97	97	97	97	97

Waste Heat Recovery	LTPS WHRU		3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72
	NTPS WHRU	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total	APGCL	339.5	376.7	376.7	376.7	379.7	379.7	379.7	329.7	376.9
Gross Unit Generation (MU)										
Hydel	KLHEP	409.5	454.9	344.0	422.5	376.0	396.3	397.1	490.0	369.2
	M.SHEP St-II					0.71	0.38	5.7	10.7	8.7
Gas	LTPS	787.8	751.7	888.1	896.2	935.3	946.7	891.4	663.4	472.0
	NTPS	530.5	565.7	533.2	526.6	591.7	507.5	356.3	325.6	314.3
Total	APGCL	1707.7	1772.3	1766.3	1845.3	1894.7	1851.1	1650.6	1489.8	1594.4
AUX Consumption (MU)										
Hydel	KLHEP	2.1	2.3	1.7	2.1	1.8	1.9	1.9	2.4	1.8
	M.SHEP St-II					0.013	0.008	0.057	0.107	0.087
Gas	LTPS	66.9	71.9	101.9	78.7	80.0	76.5	68.1	53.4	48.6
	NTPS	23.8	26.1	30.0	31.6	34.1	37.7	23.1	19.2	21.2
Total	APGCL	92.8	100.3	133.6	112.4	115.9	106.2	93.3	75.3	84.6
Net Unit Generated (MU)										
Hydel	KLHEP	407.4	452.7	342.3	420.4	365.1	394.3	395.1	487.6	367.4
	M.SHEP St-II					0.697	0.375	5.667	10.631	8.644
Gas	LTPS	700.9	679.7	786.2	817.5	855.3	870.2	823.2	609.9	423.4
	NTPS	506.7	539.6	503.2	495.0	557.6	479.8	333.1	306.4	293.1

2.2 Power Supply Position

This is a very important indicator of the power supply status. The other details connected with it in a state in a particular year like energy requirements, energy input availability, peak demand met, shortages faced and their percentages etc. play an important role in determination of power status. The power supply position details for last nine years is shown in the table below.

Table 2.2 A: Requirements and Shortages of Electricity in Assam

Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Energy requirements in Million Units (MU)	5403	6877	6392	7434	9104	8279	9200	8694	9173
Energy Input Availability	5031	5777	5885	6965	7165	7857	8139	8694	8678
Shortage (MU)	372	1100	507	469	1939	422	1061	0	495
Peak Demand (MW)	1065	1135	1286	1362	1423	1526	1679	1823	1894
Peak Demand Met (MW)	947	1060	1068	1218	1194	1450	1633	1744	1809
Shortage(MW)	118	75	218	144	229	76	46	79	85
Shortage in %	11	6	16	11	16	5	3	4	4

The energy requirements in Assam has been worked out at 9173 Million Units (MU) for the year 2018-19, the requirement was 8694 MU in 2017-18 and 9200 MU for 2016-17. The state however generated 1994.459 MU of power in 2018-19, 1489.848 MU in 2017-18 and 1650.60 MU in 2016-17. The peak demand of electricity in the state has increased from 1679 MW in 2016-17 to 1823 MW in 2017-18 and further to 1894 MW in 2018-19; the shortfall in percentages being 3%, 4% and 4% respectively during the period of last three years.

2.3 Transmission, Distribution and Commercial Losses

Power, when supplied to various categories of consumers in different places, passes through various stages of transformation of higher voltage level to lower voltage levels. This process involves energy losses known as transmission, distribution and commercial losses. The aggregate and commercial loss in percentage was 29.91% in 2010-11, 30.48% in 2011-12, 28.94% in 2012-13, 28.60% in 2013-14, 22.37% in 2014-15, 20.06% in 2015-16, 24.30% in 2016-17, 16.08% in 2017-18 and 21.97% in 2018-19. Though the situation is gradually improving, however power loss through transmission is an important issue and area of concern, especially for a power deficit state like Assam. In order to bring down the T&D losses, following measures have been taken.

- Energy accounting and electricity live ring fencing under R-APDRP

- Repair and maintenance and re-conducting of 33KU, 11KU and LJ lines.
- Changing and replacing of electromechanical meters to electronic meters
- Establishment of police cells in different cities for theft detection
- Energy bill payment through net banking procedures

In Assam, the transmission, distribution and Commercial losses for a period of last nine years in shown in following table.

Table 2.3 A: Transmission and distribution (T&D) losses and Aggregate Transmission and Commercial (AT&C) losses

Items	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Energy Input (At APDCL end availability)	4972	5684	5871	6462	6599	7571	7948	8273	8574
Energy Billed (MU)	3535	3969	4205	4763	5485	6199	6526	6814	6968
T&D Losses(MU)	1437	1715	1666	1699	1470	1372	1422		1970
T&D Losses %	28.90	30.17	23.38	26.29	21.14	18.12	17.89	17.64	18.72
Amount Billed (INR in Lakhs)	158457	201265	227501	273980	318946	380981	443168	476475	522397
Amount Realized (INR in lakhs)	148942	190666	218035	265405	313939	371975	408580	467622	507640
Collection Efficiency(%)	94.00	94.73	95.84	96.87	98.43	97.64	92.20	102.34	97.18
Overall Efficiency (%)	70.09	69.52	71.06	71.40	77.63	79.94	75.70	84.28	
AT&C Losses (%)	29.91	30.48	28.94	28.60	22.37	20.06	24.30	16.08	21.97

2.4 Number of Electricity Consumer

As per 2011 census, 37 per hundred households in Assam use electricity as a source of lighting as compared to 67 households at the national level. The rural-urban difference in use of electricity as a source of light is very high in Assam. Only 28% of rural households use electricity use electricity for lighting as compared to 84.1 urban households in Assam.

Table 2.4 A: Households using electricity as a source of lighting

Item	Assam			India		
	Rural	Urban	Total	Rural	Urban	Total
Total Households	5374533	992742	6367295	167826730	78865937	246692667
No. of households using electricity	1524221	834679	2358900	92808038	73089256	165897294
% of households using electricity	28	84.1	37	55	93	67

The number of electricity consumers in Assam during the last nine years is shown in the table given below:

Table 2.4 B: Total number of Electricity Consumers on Assam

Year	Domestic	Commercial	Total
2010-11	1655207	166399	1821606
2011-12	1811129	172310	2036429
2012-13	2130992	181781	2312773
2013-14	2640938	188801	2829739
2014-15	3018433	211869	3230329
2015-16	3468173	205080	3673253
2016-17	3605099	241652	3846751
2017-18	3931021	256001	4187022
2018-19	5037642	273205	5310847

2.5 Sector Wise Electricity Consumption in Assam

The sector wise electricity consumption in Assam for the last four-year period is shown in the following Table. All figures are in Million Units (MU), except stated otherwise.

Table 2.5 A: Sector wise electricity consumption in Assam

Sector	Period			
	2015-16	2016-17	2017-18	2018-19
Industrial (Including Irrigation)	1505	1377	1463	1661
Agriculture	12	15	20	28
Domestic	3115	3423	3704	3478
Commercial	908	1013	979	1097
Public Services*	161	190	84	102
Others	498	508	564	603

*Government offices, government institutions (schools, colleges etc.), public lighting and water supply works.

2.6 Sector Wise Electricity Generation in Assam

The electricity generated in Assam from State and Central Government production units in Million Units (MU) is shown in the following table.

Table 2.6 A: Sector wise electricity generation in Assam

Source	Electricity Generated			
	2015-16	2016-17	2017-18	2018-19
State Sector				
Thermal	-	-	-	-
Natural gas	1377	1247	989	1216
Hydro	394	397	490	370
Renewable	10	19	25	10
Central Sector				
CSGS	4890	6124	6138	-

3. Rural Electrification:

The power development has taken up a number of initiatives for electrifying the rural areas of the state under the flagship programmes of Rajiv Gandhi Gramin Uaidyutikaran Yojna (RGGUY) and Deendayal Upadhyaya Gram Jyoti Yojna (DDUGTY).

3.1 Rajiv Gandhi Gramin Uaidyutikaran Yojna (RGGUY)

The RGGUY is a scheme for attaining the goal of providing access to electricity to 8406 Un-electrified villages and provide BPL connections to around 10 lakh customers in 1308 already electrified villages in the state. In Assam, RGGUY was implemented from April, 2007. Under this programme, 90% grant is provided by the government of India and 10% as a loan by Rural Electrification Corporation. Under RGGUY, electrification works in 8348 un-electrified villages and 12841 partially electrified villages have been completed. In addition, electricity connection has been provided to 1214398 BPL households free of cost.

3.2 Deendayal Upadhyaya Gram Jyoti Yojna (DDUGJY)

The DDUGJY was announced in the budget of 2014-15. The scheme envisages feeder separation, strengthening of sub-transmission and distribution network, installation of meters at all levels- input points, feeders, distribution transformers, minor grid, off grid distribution-and rural electrification to already sanctioned projects. The scheme aims to provide round the clock power supply to rural households and agricultural sector.

Table 3.2 A: Status of Electrification of Villages under DDUGJY

Total Villages in Assam as per Census of 2011	Un-electrified villages as on 31.03.2015	Achievement under XII plan/DDUGJY as on 31.12.2017	Villages which could not be electrified due to uninhabited/PGR/VGR	Total Villages Electrified in Assam
26395	2892	2732	160	26235

Table 3.2 B: Coverage and Achievements as on 31.08.2020

No. of projects sanctioned	UEV (No.)		IEV (No.)		SAGY (No.)		BPL HHs (No.)	
	Target	Achieved	Target	Achieved	Target	Achieved	Target	Achieved
27	2892	2732	13973	13552	220	220	705410	696285

Table 3.2 C: Sanctions and financial utilization of different electrification schemes in Assam as on 31.08.2020 (All amounts in Crore INR)

Scheme	Sanction Cost	Amount Received	Utilization	Balance
XII Plan/ DDUGJY	1621.07	1419.75	1307.30	112.45
DDUGJY Phase I and Phase II	1274.80	1092.17	901.85	190.32
DDG	260.62	210.65	195.33	15.32
Saubhagya	2598.53	1687.06	1811.06	-124.00
Total	5754.29	4409.63	4215.54	194.09

Table 3.2 D: Status of Electrification under XII Plan, DDUGJY

Particulars	Target	Yearly Achievement				Total Achievement
		2016-17	2017-18	2018-19	2019-20	
Un-electrified villages	887	621	266	0	0	887
Partially Electrified Villages	9515	2210	2650	2595	869	8324
BPL Households	521128	99898	81291	323584	15420	520193
11 KV Line (CKT Km)	8553.06	2278.11	1745.55	2465.68	1236.222	7725.562
LT 3 PH Line (CKT Km)	7132.21	2081.21	1156.24	2417.80	781.465	6436.715
LT 1 PH	9922.70	2720.94	1797.30	3227.87	2288.67	10034.78
63 KVA DTR	2160	718	398	631	400	2147
25 KVA DTR	12818	3199	2380	4875	1938	12392
16 KVA DTR	843	120	161	269	0	550

3.3 SAUBHAGYA

Pradhan Mantri Sahaj Bijli Har Ghar Yojna- Saubhagya- was launched by Prime minister of India on 25th September, 2017. The scheme provisioned free electricity connections to all households in rural areas and poor families in urban areas. The Saubhagya scheme was launched in Assam by the Hon'ble Chief Minister on 23rd February, 2018. The drive to make people aware of the scheme started was started on 16th march, 2018.

Table 3.3 A: detailed report of Saubhagya Scheme

Particulars	Cost (INR in Cr.)	No. of Revenue Villages	No. of Households	Revised Provisional Sanction (INR in Cr.)
Rural on grid	4932.59	25015	1862832	2440.08
Rural off grid	74.58	365	6376	154.51
Urban	91.00	96	8817	3.97
Total	5098.17	25476	1878016	2598.56

Table 3.3 B: Progress under the Saubhagya Scheme

SAUBHAGYA	Household connection under Saubhagya Dashboard (in Lacs.)		Balance Households as on 31.03.2019 (in Lacs)	Additional Identified Households as on 31.08.2020 (in Lacs)
	Coverage	Achievements as on 31.03.2019		
		19.04	17.45	NIL (Dashboard freed)

Household connections released against SAUBHAGYA w.e.f 11 th Oct,2017	11.60	14.25
Household connections released against XII/DDUGJY w.e.f 11 th Oct, 2017	5.85	5.85
Total Households	17.45	20.10

3.4 Gram Swaraj Abhiyaan (GSA)

The GSA was started by the government of India from 14th April, 2018. The aim of this movement is to promote social harmony and spread awareness about government schemes. As a special endeavour during GSA, eligible households were made beneficiaries of seven flagship programs of the government including those for rural electrification like Saubhagya.

Table 3.4 A: Achievements of Saubhagya

Category	TARGET		Achievement as on 31.03.2019	
	Village	Households	Village	Households
GSA-I	3042	283215	3042	283215
GSA-II	2728	405544	2728	405544

4. Initiatives for Solar Power Generation in Assam:

Solar power has become strategic in terms of economic growth. Renewable energy is now no longer considered an alternative source of energy, but has rather become a part of the mainstream energy sources to meet the demands for meeting the demands of the nation's growing power requirements. With the boost in population and infrastructural development, the demand for electricity in Assam is on ever high limits. However, the state witness excess demand for electricity compared to the supply, resulting in power scarcity in the state.

The Government of Assam has allocated budgetary support for solar rural electrification models through mini and micro models. Solar power is particularly beneficial in remote villages of the state where population is sparsely distributed. Besides, many villages in Assam are located near the banks of the Brahmaputra River, which get inundated every year due to multiple waves of flood. Installation of electric power lines is therefore not a viable alternative in such areas. Solar power will not only provide basic comforts to the rural households but also provide a scope for infrastructural development in such areas. Hybrid solar and wind prototypes are another promising alternatives in the region. The hilly slopes of Assam are ideal for setting up of wind power stations.

Rooftop photovoltaic power plant is also a viable option for solar energy application. Several schemes of the Assam Government target large roofs or vacant land of government offices, hospitals, educational institutions to be utilized for solar power harvesting. It is expected that such schemes will meet the partial load of buildings during working days and contribute the surplus to the power grids during the weekends and holidays.

Keeping in view the importance of solar power, the government has proposed to install solar panels in major tourist locations like Kamakhya, Kaziranga, Majuli, Tezpur, Sualkuchi, Manas and Pobitora. Accordingly, INR 3000 lakhs has been sanctioned for necessary solar infrastructural development. In 2017-18, six new power projects with an installed capacity of 247 MW was proposed. In the same year, the government had launched the flagship programs of setting up of two solar power plants having capacities of 69 MW in Sivsagar District and 20 MW at Kamrup District, thus providing uninterrupted power supply to 5 major towns- Guwahati, Sivsagar, Dibrugarh, Sualkuchi, Rangapara and Jorhat. Besides, the Ministry of New and Renewable Energy of the Government of India has also proposed projects for generating 688 MW of power from renewable resources by 2021-22.

Under Restructured Accelerated Power Development and Reform Programme, advanced IT implementation have been successfully completed in 67 urban centres across Assam. Measures have been taken to reduce AT&C losses in these urban areas considerably. With the implementation of Supervisory Control and Data Acquisition system, it is expected that there will be round the clock power supply in the urban areas of the state.

5. CONCLUSION:

The present schemes for electrification, though have made significant impact, are definitely not sufficient for meeting the power demand in the state of Assam. Prolonged power cuts, transmission losses and low power generation potential utilization are among the many problems that confronts the Power Sector of the state today. As Assam is undergoing increasing urbanization and industrialization, the demand for power is increasing at an unprecedented rate. The lack of proper infrastructure for power generation also worsens the problem of power shortage in many areas of the state. It has therefore become imperative to look upon alternative methods for power generation. In order to increase efficiency and sustainability of energy generation and to make electricity more accessible and affordable, it is necessary

that emphasis is put on green and renewable energy. Besides, Assam is also gifted with huge water bodies, including the mighty Brahmaputra and Barak rivers, covering a total area of 4820 square kilometres. This could serve as an important hydro power generation source to meet the growing energy requirements of the state. The need of this hour is to think about alternative ways of harnessing power from the natural resources within the state.

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AUTHOR CONTRIBUTION

PK: Data collection, data curation, data analysis, writing original draft

FSR: Data collection, data curation, supervising, editing final draft

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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