International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 02 | Feb - 2025 SJIF Rating: 8.448 ISSN: 2582-3930

Assessment of the Infrastructure Development in Delhi-Mumbai Industrial Corridor in Gujarat: A Focus on Power Requirements

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Abstract

The Delhi-Mumbai Industrial Corridor (DMIC) stands as a cornerstone of India's ambitious vision for economic growth and industrial development. This study meticulously assesses the infrastructure development within the Gujarat segment of the DMIC, with a specific emphasis on the critical aspect of power requirements. The objective is to evaluate the current state of power infrastructure, identify challenges, and propose strategic recommendations for ensuring a sustainable and robust power supply to support the burgeoning industrial activities. Its a project that aims to develop effective industrial infrastructure along a dedicated freight corridor, and Gujarat is a key state in it. With an emphasis on power needs, the trends in power consumption and the adequacy of the infrastructure in Gujarat's industrial sector are crucial.

Keywords: Industrialization, DMIC, Gujarat Power,

Introduction

Economic advancement is mostly driven by electricity. In the Indian economy, there has traditionally been a stronger relationship than unity between GDP growth and the spread of electric power. But current patterns are changing this dynamic. India's power industry mostly uses coal, taking use of the country's vast domestic coal reserves. But because of its reliance on coal, the industry is very carbon-intensive and raises a lot of greenhouse gas emissions. Moreover, more than 70% of India's oil and over half of its natural gas needs are imported, making the country's developing economy vulnerable to interruptions in the supply of energy.

The Indian economy is becoming more and more susceptible to disruptions in the energy supply due to its increasing development trajectory. Owing to the electrical grid's instability, especially when it comes to business

operations, there is an increasing reliance on diesel-fueled captive power generation. A deliberate effort is being made to diversify energy imports and encourage the development of local energy resources in light of these vulnerabilities. By reducing reliance on diesel-based alternatives and enhancing grid stability, this two-pronged strategy aims to pave the path for a more robust and sustainable energy future.

Industrialization of Gujarat

Gujarat covering just 5% of India's land area, contributes 8% to the national GDP highlighting its immense economic importance. The leads industrial production accounting for 17% of India's total output. With strategic ports handling 40% of India's Freight, it dominates industries like petrochemicals, textiles and engineering. The state fosters investment through initiatives like the investors support system boosting growth and business development.fig.1 shows sector wise investment potential in the Gujarat. The state is investing heavily to boost its economy, anticipating a sharp rise in electricity demands due to industrial growth, urbanization and higher incomes. By 2030, energy needs are expected to be 2.5 times greater than current levels. To meet this the state, secure a reliable fuel supply as much of its energy is imported. Competitive pricing could make Gujarat an industrial hub and enhance living standards. The state's restructured power sector, divided into four regions, which is shown in fig.2 and 3. It also involves both public and private companies like Torrent Power for distribution.

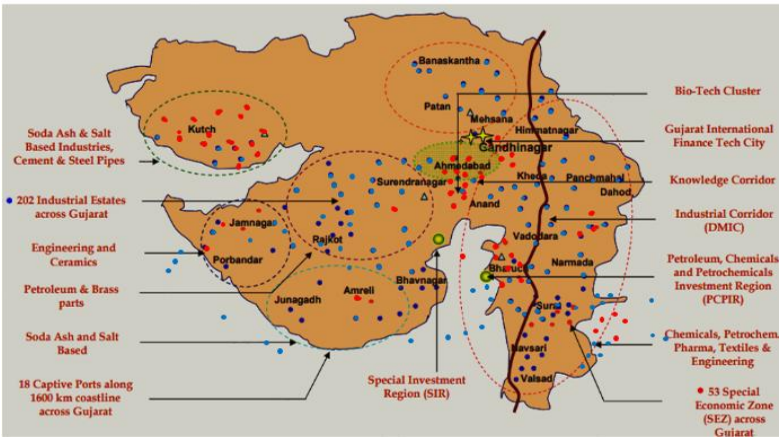


Figure 1 Sector wise Investment Potential in Gujarat
Source :- (IBEF , June 2021)

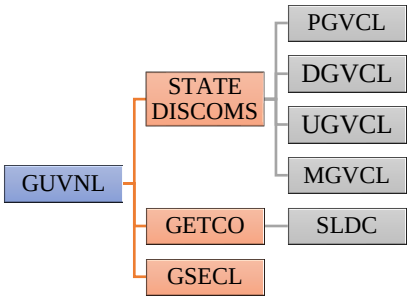


Figure 2 Gujarat Electricity Administration
Source: (Energy Sector of Gujarat, 2017)

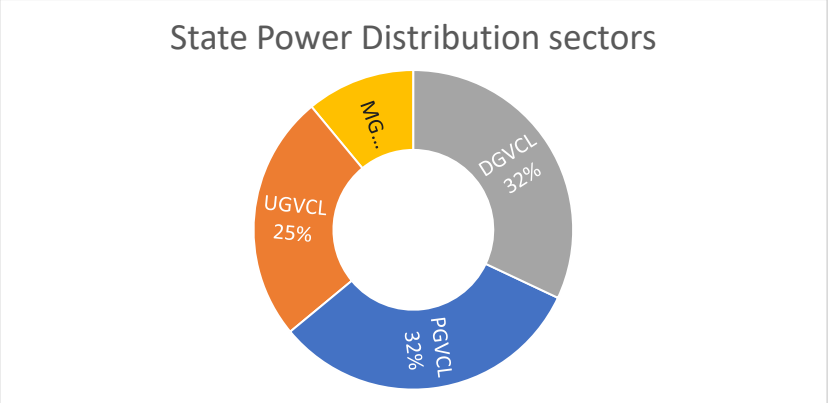


Figure 3 State Power Distribution sectors
Source: (STATE LOAD DESPATCH CENTRE, 2021-22)

1 Power Generation and Distribution

The state is a key player in India's energy sector, with a current installed capacity of 25,174 MW, including 5383 MW from renewables. By 2022, the state aims to generate 30,000 MW of renewable energy, with private companies responsible for 75 % of the output. Gujarat accounts for 9% of India's total power capacity, leading in wind (4205 MW), Solar (1127 MW) and other sustainable sources. Private companies contribute 48% of total power ensuring a robust energy supply. (which shown in fig 4,5 and 6)

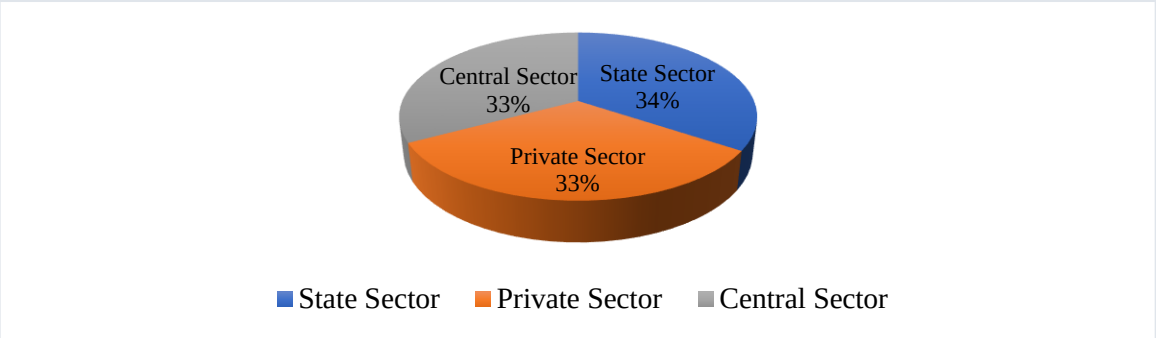


Figure 4 Installed Capacity of Power Sectors
Source: (STATE LOAD DESPATCH CENTRE, 2021-22)

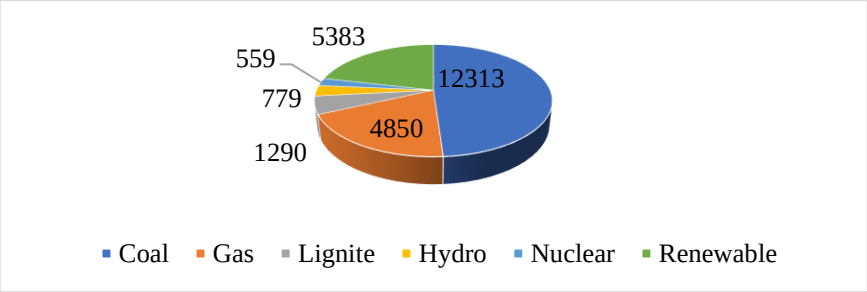


Figure 5 Fuel wise installed capacity
Source: - (STATE LOAD DESPATCH CENTRE, 2021-22)

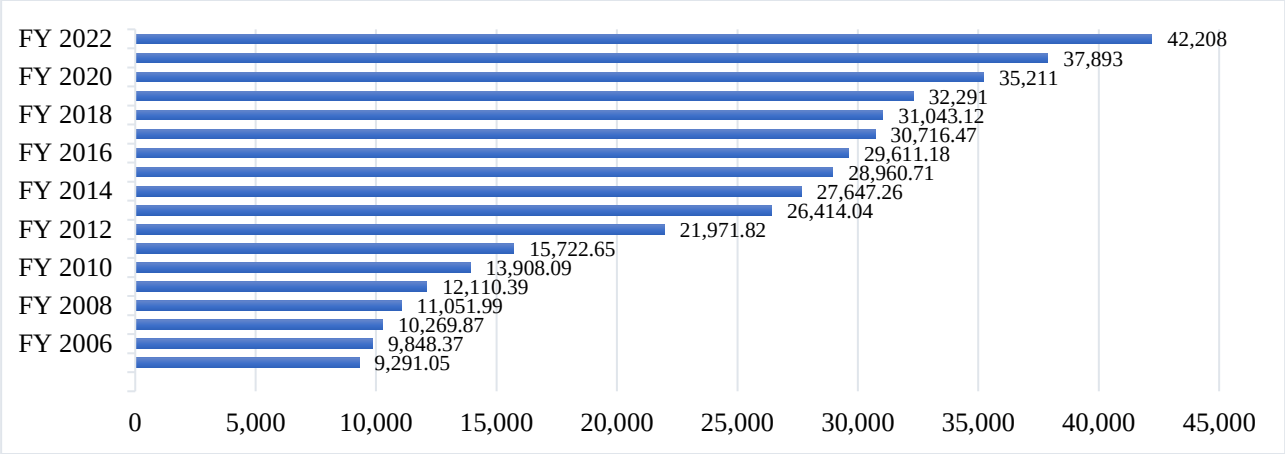


Figure 6 Installed Power Capacity in Gujarat, 2005-2022
Source: - (STATE LOAD DESPATCH CENTRE, 2021-22)

1.1 Electricity Consumption:

In 2020, Gujarat's industrial energy use rose to 30,809.7 GWh, up from 23,384.7 GWh in 2019. The average annual consumption from 1996 to 2020 was 19,977.6 GWh, peaking at 34,063.7 GWh in 2017. The Central Power Authority tracks and reports these statics.

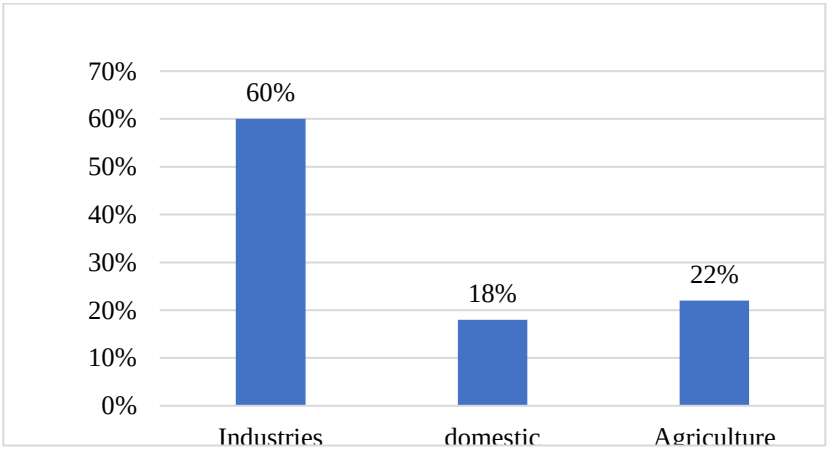


Figure 7 Power Consumption
Source:- (Energy Sector in Gujarat, 2017)

1.2 Conventional Capacity

Gujarat's power capacity has grown with new policies adding 7214 MW of coal, 1429 MW of gas, 2424 MW of wind and 1127 MW of solar. By 2022, 8000 MW of renewable energy is expected.

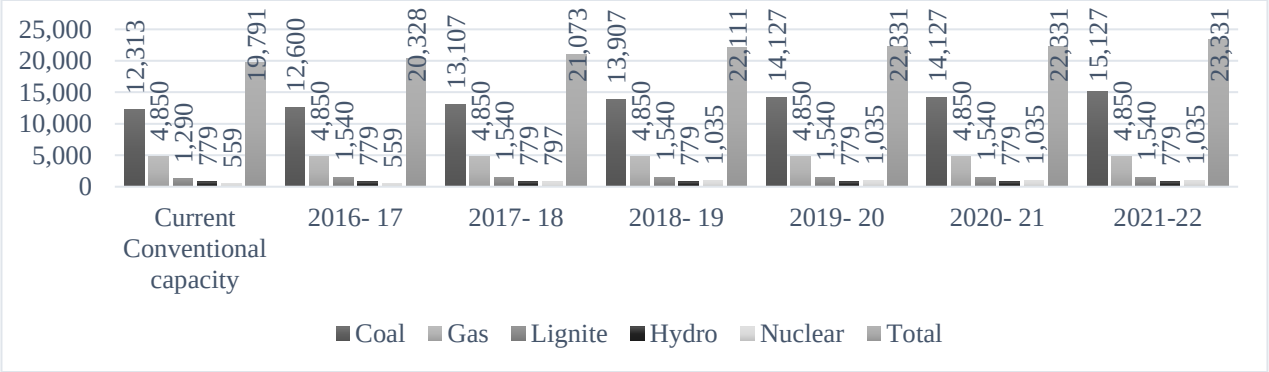


Figure 8 conventional Capacity
Source:- :- (Power Generation, 2021-22)

1.3 Thermal Power Stations – Sectors

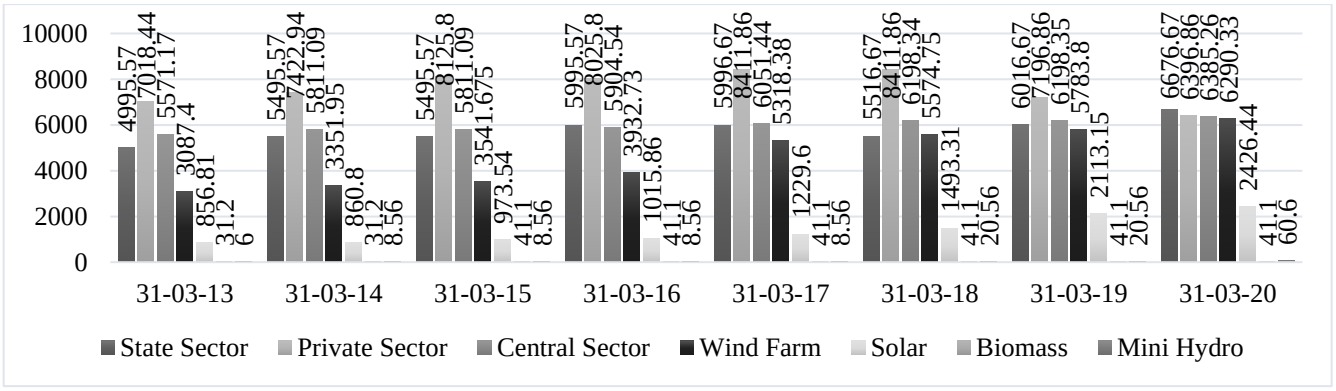


Figure 9 Sector wise installed capacity
Source:- (Power Generation, 2021-22)

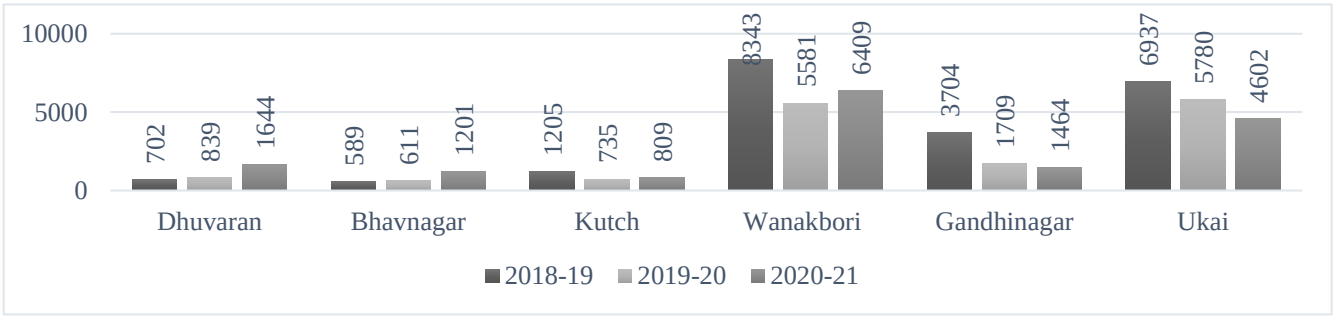


Figure 10 Thermal Power station installed capacity

Source: :- (Power Generation, 2021-22)

1.4 Comfortable Power Scenario

Gujarat's infrastructure revolution driven by initiatives like SIRs, PCPIR and DMIC aims for industrial transformation. Peak power demand will reach 21,847 MW by FY 2022 with plans for 8000 MW renewable energy.

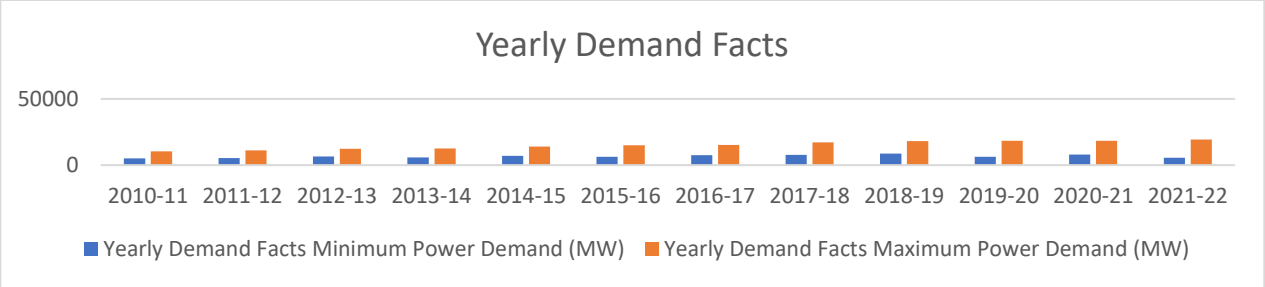


Figure 11 Yearly Power Demand

Source:- :- (STATE LOAD DESPATCH CENTRE, 2021-22)

1.5 Electricity Consumption

In 2020, Gujarat's industrial electricity consumption reached 30,809.710 GWh up from 23,384. 7000 GWh in 2019. Average consumption from 1996 to 2020 was 19,977.575 GWh with fluctuations reflecting changing industrial demands. The central Electricity Authority (CEA) monitors and reports this data annually.

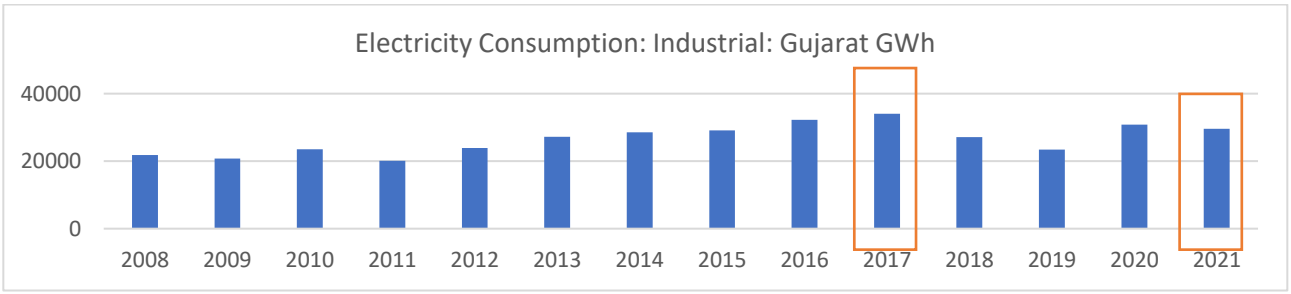


Figure 12 Electricity Consumption Industrial

Source:- (Electricity Consumption: Industrial: Gujarat, 1996 - 2021)

2 The Delhi - Mumbai Industrial Corridor (DMIC), Gujarat.

2.1 DMIC Influences area in Gujarat

The proposed DFC railway will connect key cities in Gujarat like Ahmedabad, Vadodara and Palanpur. Covering 62% of the state, rich in resources and with a 1600 km coastline offering great development potential. The DMIC spanning six states including Gujarat, aims to establish industrial hubs that will boost electricity demand. (shown in fig-13.) It encourages sustainable industries and renewable energy, contributing to a more energy-efficient greener future. Over the last 20 years Gujarat's power sector has grown to meet rising demand from residential, industrial and agriculture sectors, driven by urbanization, higher incomes and better electricity access. To manage this, energy efficiency measures have been introduced to balance consumption with sustainability. Electricity demand in Gujarat has fluctuated, increasing from 5015 MW in 2010-11 to 18,424 MW in 2019-20, in fig-14, reflecting the state's evolving energy needs amid economic growth and external events like the pandemic.

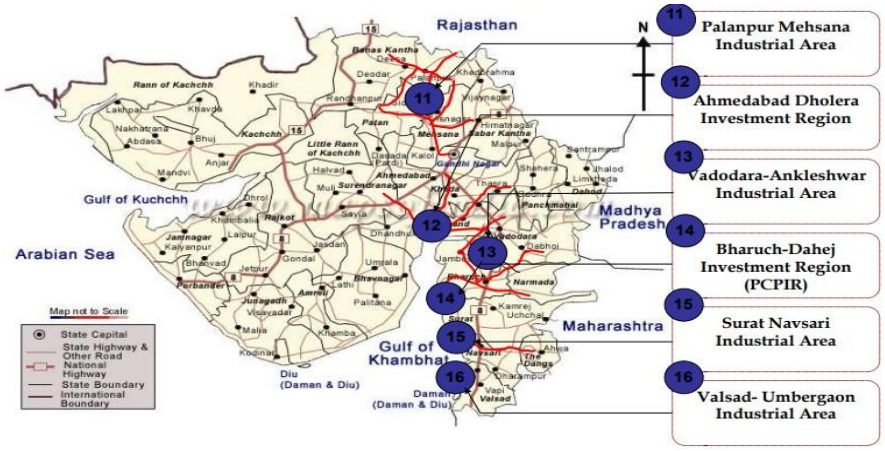
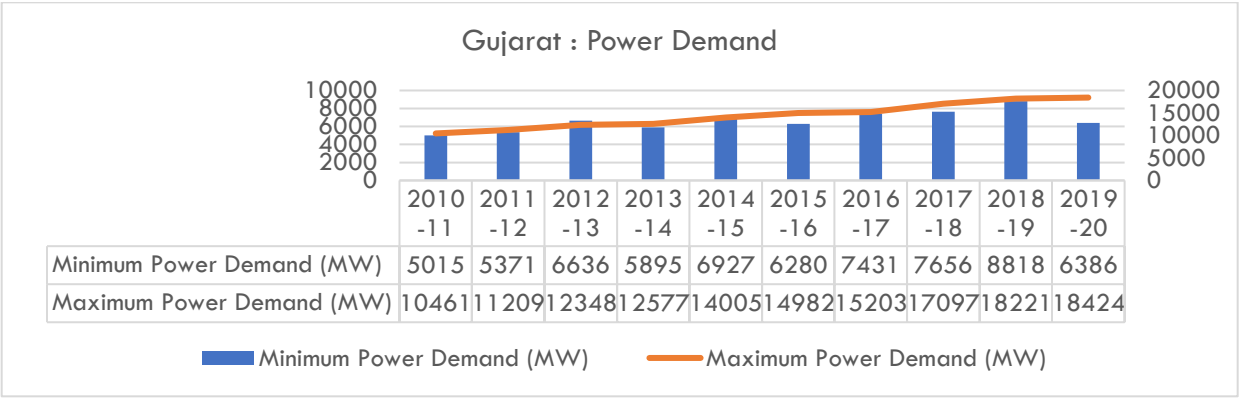


Figure 13 DMIC nodes in Gujarat

Source :- (IBEF , June 2021)



	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Minimum Power Demand (MW)	5015	5371	6636	5895	6927	6280	7431	7656	8818	6386
Maximum Power Demand (MW)	10461	11209	12348	12577	14005	14982	15203	17097	18221	18424

Figure 14 Power Demand

Source : (Energy Sector in Gujarat, 2017)

2.2 Current electricity requirements and Power deficiency in Gujarat

Power consumption in Gujarat accounts for 60% of total electricity use, with industries like cement (10,000 MW), steel (8,000 MW), and petrochemicals (5,000 MW) being the largest consumers. The state's peak demand is projected to reach 18,875 MW, with a surge of 10,000 MW driven by the DMIC. Despite efforts to increase generation and improve infrastructure, the power deficit continues to rise due to urbanization, insufficient renewable growth and outstand transmission systems contributing to disruptions and power losses.

2.3 Industrial power consumption in last five years

The graph shows Gujarat's power deficit grew from 30,000 GWh in 2017 to 42,000 GWh in 2021 highlighting a concerning rise due to industrial demand.

Table 1 Power deficiency in Gujarat due to Industrial power consumption

Year	Total Power Consumption (GWh)	Industrial Power Consumption (GWh)	Power Deficiency (GWh)
2017	78,276	48,276	30,000
2018	83,276	50,276	33,000

2019	88,276	52,276	36,000
2020	93,276	54,276	39,000
2021	98,276	56,276	42,000

Source:- (CENTRAL ELECTRICITY AUTHORITY, 2022)

Gujarat's rising power deficit stems from increased industrial demand and underfunding of new power capacity causing outages, higher costs and economic strain.

The development of six nodes in Gujarat's DMIC is expected to increase power demand by 10%-15% by 2025, particularly in industrial hubs like Dholera and Shendra. Challenges include funding constraints, environmental impact and a shortage of skilled workers. Ensuring sustainable power infrastructure is critical for supporting this growth.

3 Conclusion

To address Gujarat's power shortage, the state government must act swiftly to strengthen its energy infrastructure. This involves expanding power generation capacity, improving grid efficiency and working with industries to reduce consumption. As electricity demands grows, especially in the industrial sector, these actions are essential to avoid exacerbating the crisis. A multifaceted approach is recommended, focusing on renewable energy, upgrading existing infrastructure, modernizing transmission networks and addressing resource allocation challenges. A long term plan is crucial to ensure reliable power for Gujarat's evolving industrial and urban needs. Particularly with the development of the DMIC. As industrial growth accelerates across key nodes power demand will rise significantly. Therefore, proactive measures are necessary to meet this demand and support sustainable growth. Government intervention, coupled with strategic planning, can secure a stable power supply, driving economic progress and improving the quality of life for residents.

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