Energy Sector in Gujarat
Research Report
Vibrant Gujarat Summit 2017
Preamble

Energy & Petrochemicals Dept., Government of Gujarat has published this Research Report through a Consultant of repute for information on development of Energy sector in the State.

This Research Report is intended to provide first-hand information to Entrepreneurs, Investors, Industries etc. during Vibrant Gujarat Summit 2017. Every attempt is made to ensure the accuracy and reliability of the information provided in this document. However, the information is provided "as-is" without warranty of any kind. Investors are advised to undertake detailed due diligence before taking any investment decision.
Gujarat - a Power Surplus State with 100% Electrification, 24×7 Power Supply And Lowest AT&C Loss
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<th>Description</th>
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<tbody>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>GOI</td>
<td>Government Of India</td>
</tr>
<tr>
<td>MOP</td>
<td>Ministry of Power</td>
</tr>
<tr>
<td>MNRE</td>
<td>Ministry of New &amp; Renewable Energy</td>
</tr>
<tr>
<td>CEA</td>
<td>Central Electricity Authority</td>
</tr>
<tr>
<td>CERC</td>
<td>Central Electricity Regulatory Commission</td>
</tr>
<tr>
<td>SERC</td>
<td>State Electricity Regulatory Commission</td>
</tr>
<tr>
<td>GERF</td>
<td>Gujarat Electricity Regulatory Commission</td>
</tr>
<tr>
<td>APTEL</td>
<td>Appellate Tribunal</td>
</tr>
<tr>
<td>SLDC</td>
<td>State Load Dispatch Centre</td>
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<tr>
<td>RLDC</td>
<td>Regional Load Dispatch Centre</td>
</tr>
<tr>
<td>NLDC</td>
<td>National Load Dispatch Centre</td>
</tr>
<tr>
<td>CTU</td>
<td>Centre Transmission Utility</td>
</tr>
<tr>
<td>STU</td>
<td>State Transmission Utility</td>
</tr>
<tr>
<td>GSECL</td>
<td>Gujarat State Electricity Corporation Ltd</td>
</tr>
<tr>
<td>GETCO</td>
<td>Gujarat Energy Transmission Corporation Ltd</td>
</tr>
<tr>
<td>GEDA</td>
<td>Gujarat Energy Development Agency</td>
</tr>
<tr>
<td>GUVNL</td>
<td>Gujarat Urja Vikas Nigam Ltd</td>
</tr>
<tr>
<td>DGVCL</td>
<td>Dakshin Gujarat Vij Company Ltd</td>
</tr>
<tr>
<td>PGCIL</td>
<td>Paschim Gujarat Vij Company Ltd</td>
</tr>
<tr>
<td>MGVCL</td>
<td>Madhya Gujarat Vij Company Ltd</td>
</tr>
<tr>
<td>UGVCL</td>
<td>Uttar Gujarat Vij Company Ltd</td>
</tr>
<tr>
<td>EA</td>
<td>Electricity Act</td>
</tr>
<tr>
<td>MU</td>
<td>Million Units</td>
</tr>
<tr>
<td>MW</td>
<td>Mega Watts</td>
</tr>
<tr>
<td>GW</td>
<td>Giga Watts</td>
</tr>
<tr>
<td>LGBR</td>
<td>Load Generation Balance Report</td>
</tr>
<tr>
<td>CAGR</td>
<td>Compound Annual Growth Rate</td>
</tr>
<tr>
<td>CHP</td>
<td>Combined Heat Plant</td>
</tr>
<tr>
<td>MT</td>
<td>Million Tonnes</td>
</tr>
<tr>
<td>PFA</td>
<td>Power For All</td>
</tr>
<tr>
<td>RPO</td>
<td>Renewable Purchase Obligation</td>
</tr>
<tr>
<td>GENCO</td>
<td>Generation Company</td>
</tr>
<tr>
<td>KV</td>
<td>Kilo Volt</td>
</tr>
<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
</tr>
<tr>
<td>PGCIL</td>
<td>Power Grid Corporation India Limited</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>Description</td>
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<td>---------------</td>
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<tr>
<td>MVA</td>
<td>Mega Volt Ampere</td>
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<tr>
<td>EHV</td>
<td>Extra High Voltage</td>
</tr>
<tr>
<td>PLF</td>
<td>Plant Load Factor</td>
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<tr>
<td>DSM</td>
<td>Demand Side Management</td>
</tr>
<tr>
<td>GOG</td>
<td>Government Of Gujarat</td>
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<tr>
<td>OPGW</td>
<td>Optical Ground wire</td>
</tr>
<tr>
<td>HT</td>
<td>High Tension</td>
</tr>
<tr>
<td>LT</td>
<td>Low Tension</td>
</tr>
<tr>
<td>AT&amp;C</td>
<td>Aggregate Technical &amp; Commercial</td>
</tr>
<tr>
<td>ARR</td>
<td>Average Revenue Realised</td>
</tr>
<tr>
<td>ACS</td>
<td>Average Cost Of Supply</td>
</tr>
<tr>
<td>FPPPA</td>
<td>Fuel &amp; Power Purchase Price Adjustment</td>
</tr>
<tr>
<td>PMU</td>
<td>Phasor Measurement Unit</td>
</tr>
<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>DDUGJY</td>
<td>Deen Dayal Upadhyay Gram Jyot Yojana</td>
</tr>
<tr>
<td>IPDS</td>
<td>Integrated Power Development Scheme</td>
</tr>
<tr>
<td>UDAY</td>
<td>Ujwal Discom Assurance Yojana</td>
</tr>
<tr>
<td>IVRS</td>
<td>Interactive Voice Response System</td>
</tr>
<tr>
<td>NEFT</td>
<td>National Electronic Fund Transfer</td>
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<tr>
<td>SIR</td>
<td>Special Investment Region</td>
</tr>
<tr>
<td>PCPIR</td>
<td>Petroleum Chemicals &amp; Petrochemical Investment Region</td>
</tr>
<tr>
<td>DMIC</td>
<td>Delhi Mumbai Industrial Corridor</td>
</tr>
<tr>
<td>GIFT</td>
<td>Gujarat International Finance Tec-City</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control &amp; Data Acquisition</td>
</tr>
</tbody>
</table>
Gujarat - An Ideal Investment Destination
- **Adequate** Generation Capacity
- **Robust** Transmission and Distribution Infrastructure
- **Conducive** policy framework for Consumers and Investors

- First State to implement feeder segregation for supplying electricity to Agriculture sector through dedicated feeders
- Gujarat is the front runner among states in Ease of Doing Business as per survey conducted by World Bank
- Only state with 2 LNG terminals having capacity of 20 MMTPA
- State has coastline of 1600Km and handles 73% of India’s non major port traffic, 14% of major port traffic
- The only state in India to have State wide Integrated Gas Grid of around 2600 Km interalia GSPL’s Gujarat gas network
- Asia’s largest solar park with capacity of 750MW is located at Charanka
- Gujarat is the first state in India to achieve 100% electrification providing 24*7 electricity access with lowest AT&C losses among other states
1. Overview of Gujarat

Situated in the western part of India, Gujarat is the 6th largest state in terms of area and 9th most populous state with over 60 million inhabitants. Gujarat is one of the prosperous and efficiently governed state in India. Gandhinagar is the capital of the state, however Ahmedabad is known as the financial capital of the state. Ahmedabad ranks 3rd in the Forbes list of world’s fastest growing cities. It contributed 7.3% to India’s GDP in FY 2014. Some of the key highlights of the state are outlined below.

Table 1: Economics and Demographics of Gujarat

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Information</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>• 57% Rural, 43% Urban</td>
</tr>
<tr>
<td></td>
<td>• Decadal population growth: 19.28%</td>
</tr>
<tr>
<td>GDP</td>
<td>INR 895,202 Cr at current prices in FY 2015 with growth rate of 7.7%</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>INR 124,358 at current prices in FY 2015</td>
</tr>
<tr>
<td>Area</td>
<td>1.96 lakh square kilometres (6 % of country)</td>
</tr>
<tr>
<td>Households</td>
<td>Total 10,617,437 HHs are electrified as on FY 2016</td>
</tr>
<tr>
<td></td>
<td>• Urban electrified HH 4,837,828</td>
</tr>
<tr>
<td></td>
<td>• Rural electrified HH 5,779,609</td>
</tr>
</tbody>
</table>

Source: Census 2011, Ministry of Statistics, Statistics Times

Gujarat has a well-diversified industry profile. It accounts for 90% of the total diamond exports, 80% of the processed diamonds, 34% in produced petroleum products, 27% in chemical and pharma and 10% in engineering industries from India. Gujarat’s GDP has been registering a growth of around 10% during the past decade. State’s per capita consumption of 1,839 Kwh against nation’s 957 kwh in FY 2014-15 reveals states progressive mind-set.

Investments
- Traditionally, Gujarat has been able to attract significantly high levels of investments, including Foreign Direct Investments (FDI). In 2015, over USD 12 billion worth of investments were made across various sectors. This impressive investment focus has been a prime driver for Gujarat to generate and sustain accelerated economic growth.
- Gujarat was top state in attracting foreign direct investment in 2015

Manufacturing
- The share of industrial sector in the GDP of Gujarat is nearly 36%, compared to 44% coming of the services sector in FY 2014. Over a period of time, Gujarat has successfully diversified its industrial base and emerged as an industrial hub of India.

Infrastructure
- The State offers adequate road connectivity, reliable and consistent power supply to its consumers and has easy accessibility to the western, middle-east and African markets. It has 41 ports and provides for the longest coastline in India. Gujarat was amongst the first states in India to set-up an industrial park and is a leading State in harnessing wind energy.
Ease of Doing Business: Gujarat

A report was prepared by the World Bank in collaboration with DIPP, Ministry of Commerce & Industry to assess states with respect to implementation of business reforms. Gujarat was found out to be one of the best states for investments & industrial developments due to some of the initiatives & steps taken by State Government to promote business. State has introduced **Investor Support System** to facilitate investors in ascertaining suitable locations for setting up an industry. It provides GIS enabled layered maps of the land available for industrial use and has provision of facilitating speedy clearances to the investors. Along with this State is taking positive steps to improve upon areas like tax registration, compliance and setting up of business.

**Energy Sector Overview**

Energy is an essential building block of economic development. In an effort to meet the demands of rapid industrialization, the energy sector of Gujarat has undergone significant growth in past few years. Areas like the resource exploration, capacity additions and sectoral reforms have been revolutionized. The energy sector can be categorized primarily in to Power, Oil & Gas respectively. The power sector includes generation, transmission and distribution of electricity. The power sector has grown considerably over the years and is able to support infrastructure development in the state. As far as oil & gas sector is concerned state has major contribution in areas of exploration & production, LNG terminal infrastructure, pipeline networks, refining, petro marketing and city gas distribution.

Figure 1: Gujarat Energy Sector overview

- **Generation**
  - Generation of electricity primarily takes place from coal, gas, renewables, hydro & nuclear. Current installed capacity is around 2517 MW.

- **Transmission**
  - HECO is responsible for strengthening the transmission network of the state with 1861 substations & 25468 km of transmission lines.

- **Distribution**
  - Distribution network provides 24*7 electricity to around 1.37 Cr consumers with lowest AT&C losses of around 13.96% in the country.

- **Up Stream**
  - State has three sedimentary basins with rich hydrocarbon reserves providing great platform for exploration & production activities.

- **Mid Stream**
  - State has two LNG terminals of 20 MMTPA capacity connecting to pipeline network operated by state entity GSPC/OGAIL.

- **Down Stream**
  - Currently three refineries are producing petroleum products in the state that is being supplied across country. City gas distribution network is operated by state owned GGCCL.

The details of the State’s performance & its future plans in each sector will be summarized in subsequent chapters.
Gujarat has been **Power Surplus since 2009** and accounts for around 9% of total energy requirement in India.
2. Power sector overview

During 1980s, GEB focused mostly on rural electrification, providing new connections and maintenance activities. But as it focused on the above, profitability & revenue recovery suffered hugely. GEB ran into huge losses for several years denting the image of public sector in Gujarat.

No rays of hope were seen until the year 2001, when an initiative by the Government of Gujarat led by visionary politicians, proficient administrators and diligent employees took everyone by surprise. A major reformation which included multipronged strategies and tactics including unbundling of the board, renegotiation of power purchase agreements (PPA), reduction of interest rates on loans, curbing of power theft and reduction of huge transmission and distribution (T&D) losses without compromising with the quality of fuel.

Industry structure

Series of reforms in the 1990s and the EA 2003 has moved the power sector towards its vision of a competitive market with multiple buyers, sellers supported by regulatory, and oversight bodies. In context to this, organizations have been formed both at the central and state Government levels to facilitate development of the power sector.

Figure 2: Stake holder map of Power sector

The State undertook structural reforms wherein the erstwhile **Gujarat Electricity Board (GEB)** was unbundled on 1st April 2005 into seven companies with functional responsibilities of trading, generation, transmission and distribution as follows:
Gujarat Electricity Regulatory Commission (GERC)

GERC, constituted in November 1998 is responsible to regulate & determine tariff, issue licenses, specify the Grid Code, specify and enforce standard for quality & reliability, etc. at intra-state level, Promote cogeneration and generation of electricity from renewable sources of energy and Adjudicate upon the disputes between the licensees, and generating companies and to refer any dispute for arbitration.

Gujarat Urja Vikas Nigam Ltd (GUVNL)

GUVNL was incorporated as a Govt. of Gujarat Company. GUVNL is engaged in the business of bulk purchase and sale of electricity, Supervision, Co-ordination and facilitation of the activities of its six subsidiary companies. It is the single bulk buyer of power in the state as well as the bulk supplier to distribution companies.

Gujarat State Electricity Corporation Limited (GSECL)

Post Electricity Act 2003, GEB was unbundled in 2005 & GSECL was given responsibility of electricity generation & to undertake new power projects in the state. It currently accounts for 31% (6132 MW) of the total installed conventional capacity of the state and has achieved highest ever PAF of around 83.65%.

Gujarat Energy Transmission Corporation Ltd (GETCO)

GETCO setup in 1999 builds, operate & maintains state transmission network, company has made significant progress in network capacity addition, transmission asset management, state grid operation, smart grid solutions and human resource development. Currently it has transmission network of about 55,468 ckm and 1,671 substations with transformation capacity of around 91,544 MVA.
**Distribution Licensees in Gujarat:** Undertake the electricity distribution and retail supply in the State of Gujarat.

<table>
<thead>
<tr>
<th>State Discoms</th>
<th>Other Discoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGVCL</td>
<td>Torrent Power</td>
</tr>
<tr>
<td>MGVCL</td>
<td>ADANI</td>
</tr>
<tr>
<td>UGVCL</td>
<td>MPSEZ Utilities Pvt Ltd</td>
</tr>
</tbody>
</table>

14
Policies & Regulations in Gujarat

Power in India is a concurrent subject, implying that the onus of development of the sector lies both with the Central as well as the State Governments.

State power sector policy & regulatory landscape come under purview of State Government and GERC. Under the guiding principles of central level policies, Gujarat State Government & Regulatory Commission have come up with various policies & regulations for development of power sector, providing energy access to all at affordable price and to deal with environmental issues in the state.

Table 2: Major Policy & Regulations issued by Gujarat

<table>
<thead>
<tr>
<th>Policy/ Regulation</th>
<th>Key Highlights</th>
</tr>
</thead>
</table>
| Solar policy (2015) | • Any company or group of individuals shall be eligible for setting up a solar generating plant with capacity varying from 1KW to 1 MW.  
• Operative period: Up to 31st March 2020.  
• Solar power developer is allowed to:  
1) Use electricity for Captive consumption  
2) Sale electricity to Third party under open access  
3) Sale to Discom as per competitive bidding/ Preferential Tariff  
4) Sale through REC mechanism if registered  
• Electricity generated will be exempted from electricity Duty  
• Generator/developer shall retain 100% of CDM benefits/Preferential Tariff  
• Exemption from Cross Subsidy Surcharge (CSS) & Additional Surcharge (AS) for Captive users & 50% exemption allowed in case of sale of power to third party under open access.  
• Surplus power generated can be sold to Discoms at APPC if RE attributes are allowed to Discoms else at 85% of APPC if RE attributes are used by consumer. |
| Net Metering Regulations for Rooftop Solar (2016) | • Allowed capacity: Up to 50% of contract demand  
• Transmission loss, wheeling loss, transmission charges, wheeling charges are not applicable over electricity generated  
• Cross subsidy surcharge & Electricity duty exempted on the generated solar energy  
• Developer can avail subsidy of Rs 10,000/kw provided by State Government with a ceiling of Rs 20,000 per consumer & 30% of the discovered cost from MNRE |
| Wind energy policy (2016) | • Operative period: 5 years  
• Any individual, company will be eligible for setting up of WTG for captive use, selling to Discoms or third party  
• Allowed capacity: Up to 50% (100% for MSME) of contract demand/Load  
• Exemption on payment of electricity duty & exemption of 50% of wheeling charges & losses for captive consumers.  
• 50% exemption on Wheeling charges & losses for Captive consumers.  
• Exemption from Cross Subsidy Surcharge (CSS) & Additional Surcharge (AS) for Captive users & 50% exemption allowed in case of sale of power to third party under open access.  
• Surplus power generated can be sold to Discoms at APPC if RE attributes are allowed to Discoms else at 85% of APPC if RE attributes are used by consumer. |
**Waste to Energy Policy (2016)**
- Facilitate & promote utilization of Municipal Solid Wastes for generation of electricity at affordable cost in sustainable manner
- State Govt Facilitation & Nodal Agency: Gujarat Energy Development Agency (GEDA)
- Power sale options: 1) Captive use 2) Third party Sale 3) Sale of power to Discom/obligated entities.
- Land will be made available to developer at lease rental of Rs1/year without charging any tax, cess, royalty, levies
- Developer can avail Viability Gap funding based on competitive bidding process considering base tariff determined by GERC
- Exemption from Cross subsidy surcharge & Additional surcharge for captive consumption as well as third party sale

**Multi Year Tariff Regulation 2016**
- Gives predictability of electricity tariff over the control period minimizing risk for investor
- The regulation ensure standardization and reduce subjectivity in power procurement and to protect consumers’ interest through a process of transparent and economic procurement of power

**Open Access Regulation (2011)**
- Provides flexibility to consumers with demand more than 1 MW to source cheaper electricity from different generators
- Consumers can avail Short term, Long term & Medium term open access depending on the duration of agreement
- Promotes competition by providing open platform for buyers & sellers of electricity
- Power can be sold or purchased from within the state or outside the state
- Distribution licensee shall have highest priority in allotment of open access capacity followed by Long term, Medium term & Short term applicants

**DSM Regulations (2012)**
- Implementing cost effective DSM initiatives in state to control, reduce and influence electricity demand by encouraging consumers to amend their electricity consumption pattern through increased adoption of energy efficient technologies.
- Bulk consumers participating in DSM activities will get tariff benefits from Discoms which will lower their cost of electricity
- DSM cell will assist Discom in planning & implementation of DSM activity
- Strategic efforts to induce behavioural changes- adoption of energy efficient technologies.

**State Grid Code (2013)**
- Lay down rules, guidelines & standards to be followed by various entities in developing, maintaining & operating states power infrastructure
- Provides standards & framework for carrying any work in State power infrastructure reducing technical & operational risk for EPC & other power companies

**Gujarat Small Hydel Policy (2016)**
- Operative period: 5 years
- State Govt Facilitation & Nodal Agency: Gujarat Energy Development Agency (GEDA)
- Power sale options: 1) Captive use 2) Third party Sale 3) Sale of power to Discom/obligated entities.
- Exemption from Cross Subsidy Surcharge (CSS) & Additional Surcharge (AS) for Captive users & 50% exemption allowed in case of sale of power to third party under open access.
Surplus power generated can be sold to Discom at APPC if RE attributes are allowed to Discom else at 85% of APPC if RE attributes are used by consumer.

Obligated Entities may purchase power from Small Hydel Projects to fulfil their RPO at the tariff as determined by GERC or rate determined through competitive bidding.

### Table 3: Web links of major Policy & Regulations issued by Gujarat

<table>
<thead>
<tr>
<th>State Regulations</th>
<th>Policies/Regulations</th>
<th>Links</th>
</tr>
</thead>
</table>
Historical Demand & Supply Situation

In the last decade, State of Gujarat has remained the pioneer of the progress. The Power sector utilities have driven the socio economic growth, progress and prosperity.

- The State of Gujarat accounts for around 9% of total energy requirement in India.
- Owing to significant capacity additions in the past few years and steady reduction in T&D losses, there has been a significant improvement in the power supply position of the State.
- State’s installed capacity through conventional resources has increased at CAGR of around 8.9% in past few years.
- Even though state’s peak demand has been increasing at CAGR of 7.2% it has been successful in mitigating increase in power demand without any load shedding.
- Due to uninterrupted, quality and reliable power supply the growth is apparent and visible in all the fields viz industries, agriculture, education, health, judiciary and security systems.
- For agricultural consumers 8 hours 3 phase supply is given. Extended hours of supply is also provided to farmers to safeguard the standing crops as per the farm requirements.

Figure 4: Historic installed capacity & peak met conditions in Gujarat

(Peak demand observed is 15142 MW in FY16-17 (upto Dec))

Source: GUVNL
Gujarat has an installed capacity of around **25174 MW**. 21% of this is contributed by **Renewable Energy Source**
Power Generation Sector

Overview
The state has planned augmentation of generation capacity considering current demand supply situations as well as demand from upcoming consumers.

- Current installed capacity of around 25,174 MW – Conventional 19791 MW, Renewable 5383 MW
- Gujarat contributes to nearly 9% of total installed capacity of the country.
- Gujarat has remained frontrunner in climate efficient initiatives by adapting various policies for promoting sustainable energy sources. Installed capacity of various Renewable Energy Sources are;
  - Wind 4205 MW
  - Solar 1127 MW
  - Biomass 41.2 MW
  - Mini Hydel 9.6 MW
- Another significant fact that contributes to excellent power conditions in state is the dominance of private players in the generation sector. Private sector contributes to around 48% of total power generation followed by State Utilities with 36% and Central Plants having contribution of 16%.

Source: GUVNL, 2016

Conventional Capacity addition
The regulations and new policies have given a positive momentum to capacity addition in past years. Generation capacity addition in Coal based thermal plants has been significant along with solar & wind.

- Two of the largest Power Projects in the country i.e. 4620 MW (Adani Mundra Project) and 4000 MW (Mundra UMPP of Tata Power) is located in the Gujarat
- Torrent Power is operating 3130 MW of conventional power projects in different parts of the State
In last six years state utilities has added capacity of 7,214 MW in coal, 1,429 MW in gas, 2424 MW in wind and 1127 MW in Solar projects. By 2022 state utilities has planned to add 3540 MW from conventional sources. During the same time it is expected that around 8000 MW from renewable sources will be available in the state.

By 2022 state utilities has planned to add 3540 MW from conventional sources. During the same time it is expected that around 8000 MW from renewable sources will be available in the state.

Table 4: Fuel wise cumulative conventional capacity addition plan of state utilities till 2022 (MW)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Current Conventional capacity</th>
</tr>
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<tbody>
<tr>
<td>Coal</td>
<td>12,313 12,600 13,107 13,907 14,127 14,127 15,127</td>
</tr>
<tr>
<td>Gas</td>
<td>4,850 4,850 4,850 4,850 4,850 4,850 4,850</td>
</tr>
<tr>
<td>Lignite</td>
<td>1,290 1,540 1,540 1,540 1,540 1,540 1,540</td>
</tr>
<tr>
<td>Hydro</td>
<td>779 779 779 779 779 779 779</td>
</tr>
<tr>
<td>Nuclear</td>
<td>559 559 797 1,035 1,035 1,035 1,035</td>
</tr>
<tr>
<td>Total</td>
<td>19,791 20,328 21,073 22,111 22,331 22,331 23,331</td>
</tr>
</tbody>
</table>

Source: GUVNL

Comfortable Power Scenario – Advantage Gujarat

Gujarat is on the verge of infrastructure revolution.

- State’s gross domestic product has been rising at growth rate of 9.3% over the decade.
- State is involving integrated developments of large areas like SIRs, PCPIR and DMIC to transform the industrial scenario in the state. India’s first SEZ for global financial services GIFT emerges as a fore runner of new opportunities in Gujarat.
- Owing to the high pace of development peak demand of State is expected to reach 21,847 MW by FY 2022 at a CAGR of 6.3%.
- State has made adequate planning to meet the upcoming demand.
- Considering the focus of Government of India on promoting Renewable energy sources State would be required to add 8000 MW of Renewable energy by 2022.

Owing to adequate generation capacity tie up and planning Gujarat will remain power surplus till FY 2022.
Challenges & Issues in Sector

Renewable energy

- Gujarat is a renewable rich state and is witnessing frequent deviation in schedules due to variability in RE generation.
- In case the RE generation is excluded while working out the deviation at inter-state level, the impact of the RE generation would be minimized and would encourage further augmentation of RE sources. Alternatively, RE power may be absorbed in the national grid so that the generating stations of the State Utilities are not subjected to cyclic loading.

Rationalization of coal linkages

- State GENCo. is receiving coal from distant located mines and paying high freight cost.
- Govt. of India has implemented Policy for Flexibility in utilization of coal to enable States to reduce the cross country transportation of coal and minimize the freight cost burden. State is making constants efforts towards rationalization of coal linkages.

Imported coal based generation

- State is having long term tie up with various Generating sources based on imported coal which is subject to volatility in international markets. State is making efforts to minimize the usage of imported coal.

Availability of gas

- Gas based power plants across the country are facing fuel shortage owing to inadequate availability of cheaper domestic gas. The availability of gas at affordable rates would enable State to have optimum utilization of generation assets.

Increased awareness of carbon emission reduction

- In view of reducing carbon emission, Government is promoting power generation from renewable energy sources. Government has increased cess charge on carbon emitting fuels. With tightening of NOx & SOx emission norms the capital cost of new coal base thermal plants is expected to increase by 1 to 1.5 Cr/MW. This will increase retail tariff from coal based power generation sources.

Initiatives taken for promotion of Generation Sector

The state has undertaken several initiatives leading to increased private participation in generation segment and has achieved consistency in capacity addition to meet its rising demands. Some of the initiatives take up by state for promotion of the sector are as follows:

a) Power generation from Renewable energy sources

State has emphasized on increasing power generation from renewable sources such that RPO obligated entities like Discoms will able to meet their targets. To promote solar as well as non-solar power generation GERC has set separate RPO targets in each category. In order to promote solar power generation State has come up with Solar rooftop Net metering regulation & Solar pump schemes where in power generated can be used for captive consumption and excess power can be sold to third party or state distribution companies.
State of Art Solar Power Park Project – Charanka Gujarat

- Proposed capacity more than 750 MW. Currently 350 MW commissioned.
- Land selected 2000 Ha Govt. Waste Land for development of the Park.
- Enables accelerated development of solar project through availability of suitable land, common infrastructure, grid connectivity, water availability.

Solar Canal Top Projects

- State commissioned the world’s first canal-top solar power project over 750m on Narmada branch canal new in Mehsana district of 1MW capacity producing 1.6 MU/year/MW.
- Another 10MW Sardar Sarovar canal top project has been made operational in 2014 generating 16.2 MU/year.

Solar Rooftop Project

- For promotion of distributed power generation the state has developed solar rooftop projects of 5 MW at Gandhinagar and 4 MW at Vadodara.
- For wider consumer participation the state has rolled out the solar policy 2015 with special emphasis to solar rooftop project.
- Subsidy of Rs. 10,000/KW (maximum 2 KW) is provided by the state for these projects.

Upcoming Ultra-Mega Solar Power Park Project

- Capacity more than 700 MW.
- Proposed to be built on 1,407 Hectare of waste land in Banaskantha district.
- MNRE released grant of Rs. 30 Cr through SECI to GPCL for development of this project.
- MNRE/GoI will provide central finance assistance of Rs. 20 lakh / MW based on achievement of milestone.
b) Energy Efficiency & Energy Security

Energy efficiency adoption is gaining momentum in Gujarat. GEDA is State Nodal Agency for MNRE and State Designated Agency for BEE. It works on renewable energy & energy conservation policies framework and their implementation in State. It also undertakes investment grade energy audits on Government buildings including offices, educational institutes. Some of the other initiatives are as follows:

- State has broadened fuel base by adding renewable capacity over last few years.
- State is developing gas network & LNG terminals for improving gas availability.
- First state to implement Energy Efficient pump sets in Agriculture sector.
- Conducting Energy conservation awareness & training programs.
- Implementing energy efficiency programs like DELP (Domestic Efficient Lighting Program), NSLP (National LED Street Lighting Program), Super-Efficient Fan Program & PAT scheme in State.
**Prominent Players in Generation sector**
Following are some prominent players with significant power generation capacity in the state.

Figure 7: Major players in Power Generation

<table>
<thead>
<tr>
<th>Major Players in Generation Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSECL</td>
</tr>
<tr>
<td>GPPC</td>
</tr>
<tr>
<td>Azure Power</td>
</tr>
<tr>
<td>IPCL</td>
</tr>
<tr>
<td>CLP India</td>
</tr>
</tbody>
</table>
With **System Availability of 99.6%** GETCO operates a network of **55,468 ckt KM** and capacity of **91,544 MVA**
Power Transmission Sector

Overview
The peak power demand of Gujarat is 15,142 MW, this demand is expected to grow significantly due to increasing commercial and industrial activities. State Transmission utility GETCO has provided a robust & reliable Inter-state & Intra-state transmission network with system availability of 99.6% at average transmission losses of 3.68% ensuring 24*7 quality power supply. It also provides nondiscriminatory open access to eligible consumers as pre GERC guidelines. The transmission infrastructure of state in FY 16 is as follows

Table 5: Transmission asset of GETCO

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>Substation (Nos)</th>
<th>Transmission Line (ckm)</th>
<th>Transformation Capacity (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 KV</td>
<td>13</td>
<td>4,301</td>
<td>13,505</td>
</tr>
<tr>
<td>220 KV</td>
<td>99</td>
<td>17,847</td>
<td>28,690</td>
</tr>
<tr>
<td>132 KV</td>
<td>55</td>
<td>5,333</td>
<td>8,275</td>
</tr>
<tr>
<td>66Kv/33KV</td>
<td>1,504</td>
<td>27,987</td>
<td>41,074</td>
</tr>
<tr>
<td>Total</td>
<td>1,671</td>
<td>55,468</td>
<td>91,544</td>
</tr>
</tbody>
</table>

GETCO is the STU for the State of Gujarat whereas PGCIL is handling the Inter-State transmission of power. Inter-state EHV transmission system consists of 418 ckt km of 765 kv, 4,740 ckt km of 400 kV and 1000 ckt km of 220 KV with transformation capacity of 6,965 MVA.

Table 6: Existing Interstate Transmission System in Gujarat

<table>
<thead>
<tr>
<th>Sub-station type</th>
<th>Category</th>
<th>No. of substations</th>
<th>Transformer Capacity (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>765 kV Grid Substation (PGCIL)</td>
<td>Inter-state</td>
<td>1</td>
<td>3000</td>
</tr>
<tr>
<td>400 kV Grid Substation (PGCIL)</td>
<td>Inter-state</td>
<td>5</td>
<td>3965</td>
</tr>
</tbody>
</table>

Source: Power for All report

Historical Growth in transmission sector

Considering the ever increasing demand of electricity across state and capacity addition at the generation side, transmission network was strengthened leading to total investment of around 12,103 Cr over last five years.

Table 7: Historic capacity addition

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Particulars</th>
<th>FY 2012</th>
<th>FY 2013</th>
<th>FY 2014</th>
<th>FY 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of substations added</td>
<td>80</td>
<td>80</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Transmission Line addition (ckt Km)</td>
<td>3251</td>
<td>3027</td>
<td>2160</td>
<td>2400</td>
</tr>
</tbody>
</table>

Source: GETCO Tariff orders
Capacity addition in transmission sector

Expected electricity requirement of Gujarat by FY 2021-22 would be around 1,29,549 MU. In order to match above capacity addition, GETCO has planned to increase its number of substations & intrastate transmission line with investment of around 13,234 Cr in next five years. By FY 2022 GETCO will have transmission asset of total 2,166 substations & 68,168 ckm of transmission line details of which have been given in the following table:

Table 8: Transmission asset by 2022

<table>
<thead>
<tr>
<th>Year</th>
<th>Substation (Nos)</th>
<th>Transmission Line (ckm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2016-17</td>
<td>100</td>
<td>2400</td>
</tr>
<tr>
<td>FY 2017-18</td>
<td>100</td>
<td>2200</td>
</tr>
<tr>
<td>FY 2018-19</td>
<td>80</td>
<td>2100</td>
</tr>
<tr>
<td>FY 2019-20</td>
<td>75</td>
<td>2000</td>
</tr>
<tr>
<td>FY 2020-21</td>
<td>70</td>
<td>2000</td>
</tr>
<tr>
<td>FY 2021-22</td>
<td>70</td>
<td>2000</td>
</tr>
</tbody>
</table>

Source: GETCO

Challenges in Transmission sector

RE Grid Integration Issue

- Renewable Energy resources are remotely located from the load centers. Due to variability of RE generation the system operator is facing issues of grid management. State Regulatory Commission has incorporated scheduling of wind and solar generators in its Grid code in 2016. Forecasting is done by generators & SLDC is ensuring secured grid operation.

Right of Way (RoW) clearance issue.

- Obtaining Right of way clearance has been a significant challenge for smooth & timely completion of transmission projects. GIS mapping has enabled state transmission company GETCO to identify and assess transmission line path making it easier to get ROW clearance.

Today Gujarat power sector is a major contributor for the growth of state economy. Transmission network links the generating stations and load centres and therefore its necessary to strengthen it to ensure continuity of power supply. In order to address above challenges & promote the sector GETCO had undertaken following initiatives along with adoption of latest technology to leverage its performance.
Initiatives taken for promoting transmission sector

Quick connection process
- Coordination meeting is conducted by GETCO with new EHV consumers for quick connection release such that it’ll generate revenue for Discoms.

Standardization of design & drawings
- Providing standardization of designs & drawings involved in transmission projects to save time of engineers in EPC jobs enabling easier implementation of smart grid power transmission technologies.

Technical collaboration
- Technical collaboration with Academia like IIT’s, NIT’s for solving renewable energy grid integration issues and optimum utilization of transmission line.

Land acquisition cell
- Independent land acquisition cell has been set up by GETCO to coordinate with GOG to simplify and speed up land acquisition process.

Green Energy Corridor
- In order to evacuate electricity form large capacity renewable energy projects state transmission utility GETCO has made financial provision of 1,737 Cr to add 1,570 ckm of dedicated transmission lines with capacity of around 6,160 MVA by FY 2020.

Technological Advancements

1. Substation Upgradation
GETCO has been planning to commission 765 KV substations in the state to reduce transmission losses. Total capital expenditure planned by GETCO for 765 KV substation & transmission lines is around Rs 287 Cr.

2. Smart Grid Technology
GETCO has identified following Smart Grid solutions to minimize transmission losses and simultaneously achieve safe, efficient, ecofriendly and sustainable grid operation.

Technology

**Substation Automation System & Digital Substation:** It is a system to control & monitor the substation from a single operating console. It consists of BCU and protection IEDs, fiber optic communication network with Ethernet fiber switches instead of hard copper wire.
**Smart Communication Technology - OPGW**: In this technology the tele protection equipment is being used for protection signaling and accordingly inter tripping of transmission lines are transmitted through Optic Ground Wire, this OPGW will be used for grid operations, substation automation etc. Currently 709.83 Km of OPGW laid & 20 substations have been connected & commissioned.

**Smart Conductor - High Temperature Low Sag conductor**: In order to address ROW issue smart conductor (ACSR) are used which can carry more power with low sag.

**Smart Switch gears - Gas Insulated Substation & Hybrid**: GIS hybrid substation provide protection of system with negligible maintenance cost, reduced space. Although it’s initial cost is marginally high. GIS technology has been adopted at 66/220 kV s/s at Sartanpar (Morbi) & 220 KV GIS at Atul.

**Geographical Information System**: Helps in mapping of transmission & distribution assets. It also helps engineers to identify and assess area along the transmission line path making it easier for the team to get ROW clearance. It is the first step towards asset management for the purpose of future development of transmission network & maintenance activities.
Gujarat is the first state in the Country to achieve 100% Electrification. The Discoms are among the Best Performers in the Country.
**Power Distribution Sector**

**Overview**

State topography has been distributed in four regions and each region has been allotted to a State distribution company.

- It is responsibility of state distribution company to supply electricity to consumers in that particular region.
- State took major step in allowing private participation in the distribution business.
- Torrent power has been appointed as distribution licensee for supplying electricity in Surat, Ahmedabad & Gandhinagar and Dahej.
- Total energy available to State in FY 2015-16 is around 94,025 MUs.(SLDC)
- Around 78,147 MU’s of electricity is being supplied by State Discoms & Torrent power to their consumers.

![Power Distribution Sector Diagram](image)

Source: GUVNL

**Table 9: Key Highlights of State Discoms in FY 2016**

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Data</th>
<th>Unit</th>
<th>PGVCL</th>
<th>DGVCL</th>
<th>MGVCL</th>
<th>UGVCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Divisions</td>
<td>Nos</td>
<td>45</td>
<td>19</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>Sub Divisions</td>
<td>Nos</td>
<td>240</td>
<td>121</td>
<td>113</td>
<td>133</td>
</tr>
<tr>
<td>3</td>
<td>HT/LT ratio</td>
<td>Nos</td>
<td>1.157</td>
<td>0.97</td>
<td>0.80</td>
<td>1.35</td>
</tr>
<tr>
<td>4</td>
<td>Number of distribution transformers</td>
<td>Nos</td>
<td>5,63,381</td>
<td>1,15,076</td>
<td>1,11,736</td>
<td>2,22,666</td>
</tr>
<tr>
<td>5</td>
<td>Number of Consumers</td>
<td>Nos</td>
<td>47,18,113</td>
<td>29,42,674</td>
<td>29,13,548</td>
<td>31,94,710</td>
</tr>
<tr>
<td>6</td>
<td>Number of Employees</td>
<td>Nos</td>
<td>13,657</td>
<td>6,793</td>
<td>7,340</td>
<td>7,940</td>
</tr>
<tr>
<td>7</td>
<td>SAIFI</td>
<td>Nos</td>
<td>86.36</td>
<td>94.73</td>
<td>53.54</td>
<td>35.74</td>
</tr>
</tbody>
</table>
### Key Strength of Discoms

State of Gujarat has witnessed a breathtaking growth & development in the last decade. Post unbundling of erstwhile Gujarat Electricity Board; the reforms in electricity sector with proactive planning resulted in various achievements in the sector.

**Distribution Sector highlights:**

- Distribution network of the state increased from 4 Lac Ckt-Km in 2005 to 6.64 Lac Ckt-Km in 2016. Distribution feeders increased from 6245 to 14503
- State is serving 1.37 Crs consumers as against 82 lakhs consumers in 2005
- 100% inhabited villages have been electrified
- 100% Feeder Metering done
- More than 1 Lakh Agriculture connection released every year
- State distribution companies are among the best performers across the country with superior performance indices over last few years.
- Cost reflective tariffs,
- 100% collection efficiency
- Fuel & Power Purchase Price Adjustment (FPPPA) framework is operational, allowing adjustment in cost to be recovered from consumers quarterly.
- Comfortable cost coverage ratio and capital structure.
- Regulatory clarity, with timely filing of tariff petitions and issuance of tariff orders

### AT&C Losses

Gujarat is one of the state with lowest AT&C losses of around 15.96% in FY2016. Gujarat has taken some positive initiatives to minimize its overall AT&C losses. Measures taken by Discom to reduce AT&C losses are:

- Frequent theft drive
- Erection of new substation
- Laying HT/LT Arial Bunch Cable
- New transformers for improvement in voltage
- Improved metering infrastructure
- Setting up special police stations & special courts to deal exclusively with power theft related cases

---

<table>
<thead>
<tr>
<th>Reliability Index</th>
<th>%</th>
<th>98.32%</th>
<th>98.48%</th>
<th>99.96%</th>
<th>99.21%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer Failure rate</td>
<td>%</td>
<td>11.97%</td>
<td>4.29%</td>
<td>3.91%</td>
<td>4.87%</td>
</tr>
</tbody>
</table>

Source: GUVNL
In Gujarat around 57% of total population live in rural areas. Access to electricity is one of the prime need for their development. Government has given impetus to rural electrification through various state level policies. Presently all rural households have been electrified by State Discoms.

**Financial health of Gujarat Discom**

Overall financial health of State Discoms are in good shape. Utilities are making profits by improving their operational performance. Gujarat Discoms are able to keep the O&M expenses and other expenses within or below the approved level. The state has already signed up for UDAY scheme. Under this scheme, State has not opted for any loans/bonds and have participated only for operational turn around. State envisages to improve operational efficiency of state Discoms through various measures agreed as per MOU signed under UDAY.

**Average revenue realization (ARR) of the state is Rs 6.09/unit as against Average cost to Serve (ACS) of Rs 6.00/unit for FY 2015-16.**

**Financial Support from State Government**

Besides grants for various schemes and equity infusion, State Government is providing subsidy to Discom towards tariff compensation for consumer categories like Agriculture, Water works & local bodies. State Government has released tariff subsidy of around Rs 4165 Cr for the same in FY 2015-16.

**Payment track record**

Discoms are prompt in paying to private and central generating companies for purchase of power. The gap between the debtor days and creditor days has decreased over the period of years indicating less dependence on working capital funding. Some features of payment made by Discoms are as follows;
Tariff Structure

State utilities earn revenue by supplying electricity to retail customers and tariff plays crucial role to determine volume of revenues. Tariff hikes are common across the country considering current financial conditions of State Discoms. But State Discoms in Gujarat have ensured that there are no spikes in the retail tariff unlike other states since last few years, this reflects better operational performance & financial conditions of State Discoms. In past few years retail tariff has grown at an average CAGR of around 3.5% which is less than average inflation growth of around 5 to 6%.

Tariff Comparison

**Gujarat offers reliable power at most competitive rates to all consumer across all categories**

*Figure 9: Consumer category wise tariff comparison across some states*

Source: Central Electricity Authority Report

Ratings of State Discoms

As per the assessment of Annual performance of Discoms across country carried out by ICRA the Gujarat State Discoms have received the highest rating (A+) since last four years. A+ rating signify very high operational & Financial Performance capability. Such ratings enables company to attract investments.

Challenges in Distribution sector

Distribution is considered as the weakest link in the Indian power sector. In Gujarat overall condition of state distribution utilities is far better than other states, but there’s scope for improvement, the details of which are as under:

- State Utilities are making constant efforts for further reduction in T&D losses by using advance technologies in distribution segment.
- Tariff realized by distribution companies corresponding to average cost of supply has been low in case of agriculture & domestic consumers. Industrial & commercial consumers end up paying high electricity cost as compared to other consumer
categories. State has been planning to reduce cross subsidy charges & phase out dependency on subsidy.

- Continuous Augmentation & Upgradation of network in coastal area due to rough & unpredictable weather conditions.
- Ensuring safety of workmen while doing activities involving working at heights, working near live power equipment’s

### Initiatives taken for promoting Distribution Sector

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jyoti Gram Yojana</td>
<td>Jyotigram Yojana is an initiative of the Government of Gujarat in year 2003, to ensure availability of 24-hour three phase quality power supply to rural areas of the state. This enabled electricity board to monitor, price and ration power consumption separately from the residential and industrial sectors. Power theft dropped, electricity revenues increased, rural residents and industry also gained access to uninterrupted electricity 24*7.</td>
</tr>
<tr>
<td>UDAY Scheme</td>
<td>State of Gujarat through GUVNL has entered into MOU with Govt. of India. This will help state to achieve fuel security and reduce electricity tariff rates through coal swapping, reduction in AT&amp;C losses.</td>
</tr>
</tbody>
</table>
| IPDS                 | In 2015 all four State Discoms of Gujarat has taken positive steps under IPDS towards infrastructure development under this scheme. Work taken up by State Discoms is as follows:  
  - **Strengthening of Sub transmission & Distribution network:** Renovation and Modernization of existing sub-stations and lines with HT lines and new transformers into High voltage distribution systems.  
  - **Improving Metering Infrastructure:** Installation of prepaid / smart meters in Govt. establishment, AMR for feeders, Distribution transformer and high load consumers |
As a demand side management initiative, State Utilities has implemented Time of Usage pricing which enables utilities to control demand curve and help in flattening of load curve for economic operation by imposing of Time of Usage charges for energy consumption during the peak hours. State Utilities has already put in place mechanism / norms for incentivizing electricity consumption:

- Exclusive Night time tariff - 50%-70% concession in demand charges for Demand / Load Based Non-Residential (NRGP / LTMD) & HT Industrial consumers. 50% concession in energy charges
- Rebate of 40 paisa–85 paise /unit for night consumption – HT Industrial & Water Works consumers
- Rebate of 0.5% in excess of 95% power factor for HT consumers.

### Solar Water Pump set scheme

Under this scheme beneficiaries will get solar water pump sets of 3, 5, 7.5 HP by paying differential cost of Rs. 5000/HP to Discom (for normal consumers) & Rs. 1000 /HP (for SC/ ST Consumers). State Government has approved budget of Rs 125.5 Cr for installation of 4000 solar water pumps.

### Domestic Efficient Lighting Programme (DELP) scheme

It is designed to help scaling up the use of efficient lighting in the household sector. The Electricity Distribution Companies of Gujarat and Energy Efficiency Services Limited (EESL) a public sector body of Government of India are implementing the program. EESL is undertaking the distribution of 9 W LED bulbs to Discom’s consumers under categories of General Lighting Purpose (GLP), Manufacturing and Service Industries (MSI) and Residential Category Consumers. Under the program, in case of residential consumers Discom shall provide financial assistance of Rs 10 /- per LED bulb to EESL for maximum of 10 LED bulbs purchased by them. So far 2.85 Cr of LED bulbs have been distributed under this scheme.

### Energy Efficient Pump scheme

In order to promote sustainable development through energy conservation Government is providing capital subsidy to consumers using energy efficient pumps recognized by BEE. The capital subsidy will account for the price difference in energy efficient pump sets & normal pump sets.
**Improved consumer services**
Discoms are releasing over 1 lac Agricultural connections every year. Process & documentation work required to avail new connection has been simplified. Jyoti Gram Scheme for feeder bifurcation is being implemented.

State Utilities are serving around 1.37 Cr of consumers

Figure 10: Initiatives taken by Government to improve customer service in Distribution Sector

<table>
<thead>
<tr>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online Portal</strong>: To facilitate new connection, estimation of generation &amp; payment &amp; updating status to consumers with paper less transactions</td>
</tr>
<tr>
<td><strong>SMS service</strong>: Provides detailed information like bill amount, payment due, registration details, test reports, breakdown alerts etc.</td>
</tr>
<tr>
<td><strong>Bill Payment Facility</strong>: E-payment facility is extended to the consumers with RTGS, NEFT facility. This enables consumers to pay their bills through debit/credit cards.</td>
</tr>
<tr>
<td><strong>New Connection</strong>: Process to avail new connection has been simplified. Two documents namely identity proof &amp; Ownership proof are required.</td>
</tr>
<tr>
<td><strong>Customer care</strong>: Interactive voice response system is used for registering complaints, updating their status.</td>
</tr>
<tr>
<td><strong>Jan Seva Kendra</strong>: Retail outlet services equipped with documents for various applications like new connection, complaint registration, bill payment machines are made available to consumers. In year FY 2015-16, 10 nos of Jan seva Kendra have been started.</td>
</tr>
</tbody>
</table>
Technological Advancements in the sector

The Gujarat network is modelled more accurately in power system network analysis module through extensive use of information technology. It is very much helpful for critical outage security assessment and to carry out studies for proposed network topology changes etc. State distribution network is modelled up to 132 KV level in PSS/E software. Wide Area monitoring system is implemented. PMUs are installed at 25 substations. Automatic Demand Management System is implemented in all four State distribution companies. E-Urja program an ERP based end to end IT solution is being implemented by state utilities to manage the complexity of power sector Few IT initiative taken by State Discoms are captured in the table given below.

Table 10: IT initiative undertaken by Gujarat State Discoms.

<table>
<thead>
<tr>
<th>IT initiatives taken by State Discoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled GPRS based LT billing &amp; mobile applications for payment of bills to improve its collection efficiency.</td>
</tr>
<tr>
<td>Implemented RAPDRP IT applications along with Automatic Demand Management Scheme (ADMS).</td>
</tr>
<tr>
<td>Started web base consumer portal to facilitate online payment, complaint redressal and create electrical safety awareness</td>
</tr>
<tr>
<td>Implemented web base AT&amp;C loss monitoring system, consumer monitoring system</td>
</tr>
</tbody>
</table>

Source: PFA, SLDC report

Figure 11: Control room, State Load Dispatch Centre
Research Report on Energy Sector in Gujarat

Oil & Gas Sector

Gas based power generation is environment friendly and consist of almost 19% of installed capacity in Gujarat vis-a-vis 8% nationally

Largest Gas network in India

Highest LNG terminal capacity in the country
3. Oil & Gas sector

Overview

India’s primary energy consumption has been increasing at an annual growth rate of 5.5 per cent in the last 15 years. This is significantly higher than the global growth rate of energy consumption of 2.5 per cent over the same period. As a result, the country transitioned from being the world’s seventh largest energy consumer in 2000 to the fourth-largest. Oil & Gas will play a significant role in meeting the energy need, accounting for nearly 30% of the overall consumption. Despite being a net importer of crude oil, India has become a net exporter of petroleum products by investing in refineries designed for export, particularly in Gujarat.

Policy & Regulatory Structure

To promote growth in domestic oil & gas sector and attract global investments Government has come up with policies & regulations across oil & gas value chain. Some of the key policies and institutional structure has been highlighted in the figure below.

<table>
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<th>Governing ministry</th>
<th>The Ministry of Petroleum &amp; Natural Gas (MoPNG)</th>
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<td>The Petroleum &amp; Natural Gas Regulatory Board (PNGRB)</td>
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<td>Regulator</td>
<td>The Directorate General of Hydrocarbons (DGH)</td>
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<td></td>
<td>The Petroleum &amp; Natural Gas Regulatory Board (PNGRB)</td>
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| Policies & Regulations | • The New Exploration Licensing Policy (NELP).  
                           • The Coal Bed Methane (CBM) Policy.  
                           • Shale Gas Policy  
                           • Hydrocarbon Exploration License Policy |
|                    | • Authorization Regulations  
                           • Tariff Regulations  
                           • Access Code  
                           • Affiliate Code of Conduct |
|                    | • Authorization Regulations  
                           • Access Code  
                           • Technical Standards  
                           • Exclusivity for CGD networks. |
| FDI Policy         | 100% under Automatic Route |
|                    | 100% under Automatic Route |
|                    | Refining sector: 49% in case of PSU via FIPB route & 100% in case of Private companies. |
Gujarat Oil & Gas sector

Gujarat State is rich in hydrocarbon resources and is one of the largest onshore producer of oil and gas in country. Gujarat contributes about 12% of country’s total crude oil production. Similarly it contributes about 6% of country’s total gas production. Gujarat State Petroleum Corporation Ltd (GSPC) is an oil and gas exploration company in Gujarat, India. It is India’s only State Government-owned oil and Gas Company with the Government of Gujarat holding approximately 87% equity stake. GSPC was incorporated in 1979 as a petrochemical company. Today GSPC has become a vertically integrated energy company, excelling in a wide gamut of hydrocarbon activities across India.

Figure 12: Gujarat Oil & Gas industry structure

- GSPC
  - GSFL: Natural Gas Transmission Company
  - GSEG: Undertakes power generation
  - Gujarat Gas Ltd & Sabarmati Gas Ltd: Develops gas distribution network across State covering several districts.
### Gujarat Oil & Gas Sector Overview:

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<th>Sub sectors</th>
<th>Exploration &amp; Production</th>
<th>Pipeline transportation</th>
<th>LNG Port</th>
<th>Refining</th>
<th>Petro marketing</th>
<th>City Gas distribution</th>
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| **Overview** | • State has three major sedimentary basins namely Cambay, Kutch, Saurashtra.  
• State has total sedimentary reserves of 3090 MMT & CBM reserves of 351 BCM.  
• State is a major contributor of Oil & Gas production in country.  
• In FY 2015 production of 4.53 MT of oil & 1526 MMSCMD of gas took place in the state alone.  | • State is home to gas pipeline network of all major gas Transporters, such as GSPL, RGIL and GAIL.  
• Majority of gas pipelines in the State are operated by GSPL which currently transmits around 24.5 MMSCMD of gas.  | • State currently has two major LNG terminals at Dahej, Hazira with capacity of 20 MMTPA.  | • In all there are four refineries in state with total capacity of 93.7 MMTPA (13.7 Koyali + 33 RIL DTA + 27 RIL SEZ + 20 EOL).  
• Around 44% of India’s crude oil processing happens at State refineries.  | • There are 3050 retail outlets of petroleum products & 662 LPG distributors in state.  | • CNG/PNG consumption in India in Oct 2016 is 20.6 MMSCMD (Source: PPAC) and is expected to strengthen going forward.  
• GGL has evolved to become one of India’s largest players in distribution of natural gas with market share of 47% in Industrial connections, 53% in commercial connections & 35% in domestic connections.  |
### Exploration & Production

- **GSPC**
- **Reliance Industries Limited**
- **ONGC**
- **Essar Oil & Gas**
- **Oilex Ltd.**
- **HOEC**

### Pipeline Transportation

- **Gujarat State Petronet Ltd.**
- **Hazira LNG Private Ltd.**
- **Reliance Industries Limited**
- **Essar Oil & Gas**

### LNG Port

- **IndianOil**
- **Reliance Industries Limited**

### Refinery

- **IndianOil**
- **Essar Oil & Gas**
- **Adani**

### Petro Marketing

- **HP**
- **Sabarmati Gas Ltd.** (A Joint Venture of GSPC and EPC)

### City Gas Distribution

- **GUJARAT GAS**
- **Saharoni Gas Ltd.** (A Joint Venture of GSPC and EPC)

### Key Players

#### Opportunities

- Owing to technological challenges, offshore reserves remain untapped. This creates opportunities for investors equipped with technical expertise to invest through public private partnership.

- With newer industrial clusters coming up in the State and with development of newer gas sources, including LNG terminals, there are ample opportunities for players in the midstream segment to expand their reach in the State.

- Increase in gas demand & decline in domestic supply has opened up opportunities for developing LNG import facilities in State.

- Increasing refinery capacity to meet increase in demand of petroleum products provides opportunity to strategic investors, technology licensors, service providers, equipment suppliers and EPC contractors.

- Deregulation of diesel & petrol prices have opened up ample of opportunities in petro marketing segment for investors.

- Development of CGD projects provides large market for gas based equipment manufacturers & service providers in state.
PCPIR is a specifically delineated Investment Region planned for the establishment of production facilities for petroleum, chemicals and petrochemicals. Government of India is ensuring infrastructure development in the PCPIRs through highways, rail link, ports, airport etc. through Public Private Partnership (PPP) projects to the extent possible. One such region has been identified in Bharuch, Gujarat. Spread over 453 sq km of brownfield area in the Gulf of Khambhat, Gujarat PCPIR is envisioned to reap the benefits of co-siting, networking and greater efficiencies through use of common infrastructure and support services. It is in close vicinity of other chemical estates, onsite chemical & LNG port terminals.

**Infrastructure Highlights**

**Power Supply**
State provides power from its 220 KV substation linked with State grid ensuring continuous uninterrupted power supply. More power allocation to the region has been planned from Torrent Power & Adani power in years to come as both the units are under construction.

**Water Supply**
GIDC supplies 33MGD raw water from Narmada River & GWSSB provides drinking water through Narmada canals. Water supply network expansion of around 100 MGD has been proposed by Government.

**Gas Supply**
GSPL through its 2600 Km network covers entire Gujarat, including Bharuch / Dahej. Gas network serving the region is capable to meet its gas requirements.

**Railway, Road & Port connectivity**
Delhi-Mumbai railway line connects PCPIR region at Bharuch while Delhi Mumbai DFC will touch the eastern side of the region. Dahej Bharuch state highway connects Delhi Mumbai National Highway. Region is connected by GCPTCL, Reliance, Petronet ports for handling chemicals, gas & other liquid fuels.

**Advantages**
- Concentration of Petroleum, Chemical and Petrochemical estates around PCPIR will smoothen business operations.
- Large scale economic & industrial activities undertaken in PCPIR would generate employment & business opportunities in State.
- With technological & infrastructural advancements state will become hub for petroleum & chemical products in domestic & international markets.
4. Key Takeaways for Investment in Gujarat

Gujarat is the frontrunner in ease of doing business in the country

Gujarat is strategically located along the business corridor

Surplus power to support infrastructure and industrial development in future

Competitive Tariff and 24×7 Power Supply

Largest PNG network & highest LNG terminal capacity in the country

Huge Renewable potential and supportive policy framework