Cracking the Gas Code for a Gas-based Economy and Energy Transition in Gujarat

Gauri Jauhar and Abhishek Kumar

Gujarat’s Pursuit of a Gas-led Energy Transition and Cleaner Power Mix

The entrepreneurial spirit of Gujarat is a key initial and continuing theme of the story of Gujarat’s Energy Transition. “You do not require an invitation to make profits,” as articulated by Dhirubhai Ambani, the founder of Reliance Industries, typifies Gujarat’s pioneering role in not just Gujarat’s energy transition but in leading the way to show what a viable energy transition can look like across India and possibly the globe. The state has been a leader in gas-fueled energy diversification. While the gas makes up an average of 6 percent of the primary energy mix in India, Gujarat has achieved four times that level, matching global average levels of gas use. In addition to the start of the gas economy, with domestic gas supplies being the foundation, Gujarat’s favorable coastal location enabled the state to start liquified natural gas (LNG) imports in 2004, and it is now home to three operational regasification plants. One of the three plants, at Dahej, has triple the capacity of typical regasification plants elsewhere in India.

Gujarat, known for its entrepreneurial spirit, ranked second among Indian states in 2017 on CSIS’s Wadhwani Chair ranking for entrepreneurial environments. Gujarat also showcases the confluence of initial conditions and economic strength that favored a gas-led fossil fuel transition, supported by what can be replicated, nationally and internationally, through a progressive energy transition framework. Central to this story was a strong political will and leadership at various levels of government and companies that enabled Gujarat to take a pioneering role in establishing a sound basis for a gas economy. This provided a foundation of domestic resources for ushering in LNG and solving the eternal question of developing markets or infrastructure first by providing leading infrastructure, including the hardware and software, for growth of a gas-based economy.

Beneficial initial conditions range from gas accounting for 18 percent of India’s industrial GDP and around 25 percent of India’s total exports to having a domestic gas resource base, wind and solar renew-
able resources, a 1,600 km coastline, and 42 ports, which enabled imported coal and LNG to be employed in the electricity mix.

Economically underpinning the gas-led fossil fuel transition has been strong manufacturing and services-led economic growth and infrastructure development. Manufacturing and services contributed around 44 percent and 36 percent to the overall growth in 2017-2018, respectively. While agriculture contributed 20 percent to the economic growth, each sector of the economy grew by more than 10 percent in the period from 2011 to 2017. Key to manufacturing growth has been growth in the gas and electricity sectors. The state delivered one of India’s highest rates of economic growth, of 13.6 percent, over the 2011-12 to 2019-19 period.

From the first gas supplies from the Cambay Basin in 1964 to the formation of the Gujarat Gas in 1980 to the development of a power, industrial, and residential customer base, Gujarat has exhibited three essential factors for success: (1) competition diversity, (2) hard infrastructure, and (3) soft infrastructure. On the back of the combination of these three factors, Gujarat is the first state with complete coverage of gas downstream infrastructure to connect end customers.

This paper will provide case studies of how these three essentials for a viable energy transition in Gujarat converged in the regulated (power and fertilizer) and unregulated end-use sectors (industry, commercial, and residential). These three essential elements highlight that Gujarat is a best-in-class, end-member case study of a synchronous gas ecosystem approach.

**Competition Diversity**

The state government is a majority stakeholder of the gas ecosystem in Gujarat through the Gujarat State Petroleum, Gujarat State Petronet, and Gujarat Gas companies along the gas value chain. Despite this key presence of the state, a diversity of players, both national and international, have been encouraged and have sustained presence across the gas value chain.
As of March 2018, Gujarat state held nearly 20 percent of India’s total crude and 4 percent of total gas recoverable reserves, and 13 percent and about 5 percent of crude and gas production, respectively. The state also holds the prospective Saurashtra and Kutch basins. The gas value chain started with the Oil and Natural Gas Corporation (ONGC) on the upstream side in 1960s, Gujarat Gas was set up in the 1980s, and the Gujarat State Petroleum Corporation was established in 1994. Foreign players such as British Gas (through the city gas distribution segment) entered in the second half of the 1990s, followed by Shell and TOTAL in the 2000s on the LNG regasification side and the growth of new Indian private players such as Adani in the city gas distribution side. On the upstream side, diversification of competition and drilling for the last drop of hydrocarbons has occurred in the Cambay Basin, with the entry of small domestic and foreign players such as Oilex, Cairn, Niko, and Joshi Technologies.

For ushering in LNG imports, the creation of India’s largest LNG importer, Petronet LNG, in 1998 was a game changer. By creating Petronet LNG, India chose to utilize the Gujarat coastline to bring in LNG, which was still in its infancy at the time as a fuel of choice outside the traditional markets of Japan and Korea. The case study below showcases the innovation at various levels of creating the vision and the focused implementation that enabled this success.

CASE STUDY: INDIA’S FIRST LNG COMPANY—PETRONET LNG

Petronet LNG was founded by Dr. Vijay Kelkar, the petroleum secretary from 1994 to 1997, who had a vision for energy security based on LNG’s relatively lower cost compared to oil and for expanding the availability of the environmentally-friendly fuel—a vision that was forged by a conviction to deliver.

Gujarat was selected due to its proximity to the Middle East and strong local demand base. The industrial base (e.g., refineries, petrochemicals, and private power producers) enabled bulk demand for as much as 1.5 mmtpa (million metric tons per annum) out of the initial 5 mmtpa capacity at Dahej.

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The creation of Petronet LNG was completed by bringing in a new innovative model involving investors, public-sector company participation, the Asian Development Bank (ADB) (5.2 percent), and Gaz de France (GDF) (10 percent). While the ADB and GDF sold their stakes in 2014 and 2017, respectively, four of the top public-sector companies in the country’s hydrocarbon sector remain foundational promoters. Bharat Petroleum Corporation Limited (BPCL), GAIL (India) Limited (GAIL), Indian Oil Corporation Limited (IOCL), and Oil and Natural Gas Corporation Limited (ONGC) each have a 12.5 percent equity share, leading to a total of 50 percent for the four companies. The balance equity (50 percent) is held by the public. In the words of Suresh Mathur, the founding MD and CEO of Petronet LNG (and the former director of finance at the Indian Oil Corporation), this project was a “leap of faith.”

The hardware of growth for Petronet LNG was the connectivity to the Hazira-Vijaipur-Jagdishpur (HVJ) trunk pipeline, a 40-km connection from the Dahej location which was commissioned in 1997.

Petronet LNG’s Dahej project was one of many firsts that provided a strong foundation for success alongside the underlying vision, innovative business model, and infrastructure access. Other firsts included:

1. **Ensuring the Software of Growth:** There were speedy approvals by the Gujarat Maritime Board, Gujarat Environment Ministry, and the Chief Minister’s Office. India’s current prime minister, Narendra Modi, was the chief minister of Gujarat at the time and visited the site three times during project development.

2. **Time and Costs:**
   - Dahej had the lowest project costs compared to other ports.
   - It finished 18 days ahead of schedule and under budget (due to no breakwater and design innovation reducing jetty width).

3. **Regional First:** Dahej was the first South/Southeast Asia regasification terminal.

4. **World’s Single Largest Contract at the Time:** At the time this was a bold approach, based on a tender and take or pay clauses and was predicated on market development/building activity.

5. **Funding and Viability:** Parent companies offered guarantees and the IPO was subscribed 4.2 times and GDF and ADB were the strategic international investors.

6. **Infrastructure Challenges Overcome:** The Gujarat Gas Act of 2001 led to the creation of Gujarat State Petronet (GSPL).

Created with the mandate to set up the state gas grid, the GSPL is the nodal agency, operating on a common carriage basis, and has brought open access to the state of Gujarat. In addition to the GSPL, GAIL also operates transmission lines for customers in the South Gujarat network, North Gujarat network, and ex-Hazira.

Among the national private players, Reliance, Torrent, Adani, and Sabarmati have presence on the downstream side of the gas sourcing and city gas distribution side of the business. Torrent Power is the largest private-sector power entity consuming LNG and owns and operates the country’s largest private sector gas-based power plant project, the Sugen plant, which generates of 1,147.5 MW.²

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BG, among the first international oil and gas companies to make a commitment to the gas value chain in India, entered Gujarat by acquiring a 65 percent stake in Gujarat Gas in 1997. Gujarat Gas had been formed in 1980 by the Gujarat government when the ONGC allocated 170,000 SCMD (standard cubic meters per day)—or 6 MMSCFD (million standard cubic feet per day)—of gas to an investment arm of the Gujarat government for supply to small and medium consumers. The company had signed a joint venture agreement with the Mafatlal Group, a textile industry leader, in June 1988 for the purchase and distribution of gas to industrial, commercial, and domestic consumers.

After BG, the next international investor which saw potential in the Gujarat gas story was Shell, which built India’s first merchant regasification plant in 2005 at Hazira, with a 5 mmtpa capacity. This was shortly after India’s first LNG plant backed by long-term supplies was started by Petronet at Dahej in 2004. While TOTAL also entered the Shell Hazira facility with a 26 percent stake in 2019, it sold the stake back to Shell as it began its next foray with the Indian private player Adani for the city gas distribution business and for partnering in its upcoming east coast Dhamra terminal.

On the gas sourcing side, private players such as Reliance source LNG for the Jamnagar refinery and Torrent for its power plants. Going forward, Reliance’s requirement is likely to vary based on building petroleum coke crackers. Torrent ranks in the top tier of power utilities due to high operational efficiencies and significant reduction in aggregate technical and commercial (AT&C) losses.

**Hardware of the Gas-based Economy: Infrastructure, Gas Pipelines, and Power Capacity**

Infrastructure has been critical to unlocking the favorable gas and renewable resource potential of the state. The state’s gas transmission pipeline network of more than 2,700 kms constitutes more than 20 percent of India’s total gas pipeline network and is supported by an end-consumer gas distribution pipeline network of 22,000 kms. It is the only state in India to have a state-wide integrated gas grid.²

In terms of power capacity mix, Gujarat has a greater bias toward a cleaner power footprint than the rest of India: gas accounts for 21 percent of the power mix, compared to 10 percent in the western region and 7 percent in India overall. Similarly, renewables account for 24 percent of the power mix, compared to 18 percent in the western region and 20 percent in India overall. Together, gas and renewables constitute 43 percent of Gujarat’s power mix, a close second to coal, at 51 percent.

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In addition, Gujarat has been a power surplus state for the last six years, despite per capita electricity consumption of 1,670 units, relatively higher than the national average consumption of 1,100 units. This follows a strong record of additions to generation capacity. While conventional capacity additions grew 8.4 percent, from 12 GW in FY 2010 to 23 GW in FY 2018, renewable capacity additions rose by 20 percent during the same period. Over the past five years, peak energy demand in the state grew around 7 percent, and the outlook remains strong, with a projected growth of 5.9 percent in the electricity market by 2025.4

The economic strength underlying the state power system is visible in the pattern of the private sectors’ higher relative ownership share in installed capacity. The private-sector share in the capacity mix is approximately 61 percent as of 2018, higher than the western region (WR) and national shares of 53 percent and 45 percent, respectively.

Gujarat’s total installed capacity was 34.5 GW as of October 2019, accounting for 9 percent of India’s total installed capacity.5 Gujarat’s electricity production has increased steadily from 103.1 billion units in 2015-2016 to 121.9 billion units in 2018-2019.6 Today, the assured availability of high-quality power is one of the key distinguishing features of the state. Under the Jyotigram scheme, it has ensured three-phase, round-the-clock electricity in all 18,000 villages in the state in 2006.7 These, along with several other measures, have helped the state in achieving its progressive stature, including 100 percent electrification and openness to reform.

Gujarat is one of the few states in the country which has successfully unbundled its electricity sector. This has resulted in an increase in profit for all companies in the group, improved service delivery and customer satisfaction, increased revenue generation and collection, and a reduction in transmission and distribution (T&D) losses, with 100 percent metering and billing of all consumers. Gujarat has taken numerous measures toward power-sector reforms. In 2005, the Gujarat Electricity Board (GEB) was reorganised into seven companies with functional responsibilities in power generation, transmission, and distribution. Its four distribution companies have A+ credit ratings and AT&C losses under 15 percent and provide uninterrupted power throughout the energy surplus state, with separate feeders for up to eight hours a day of agricultural supply. Reforms enacted in Gujarat subsequent to the national Electricity Act of 2003 have now been initiated nationwide. Gujarat is among the six Indian states which have implemented 100 percent feeder segregation and smart metering under the UDAY scheme (others being Haryana, Punjab, Andhra Pradesh, Madhya Pradesh, Karnataka).

Software of the Gas-based Economy: Leading Policy and Regulation

The Gujarat government has enacted policies in almost all key sectors such as industry, power, ports, roads, agriculture, and minerals—doing so in key instances before the Indian central government. Political stability, with continuous rule by a single political party, has allowed an element of long-term planning that is partly based on using fiscal space to plug gaps in federally sponsored schemes with state-level initiatives. The programs focused on creating an environment for private investment. Gujarat ensured that the hardware and software of growth worked together to lay the foundations of a cleaner fuel mix. It laid down policies to increase efficiency of public expenditure and e-governance and overcome barriers to development.

4. Ibid.
Under Gujarat’s infrastructure agenda, the state government implemented Vision 2010 to remove impediments in implementation of fast-track infrastructure projects and presented the state with a coherent and comprehensive action plan for integrated development across all infrastructure sectors.\(^8\) This was followed by the Blueprint of Infrastructure (BIG) 2020 in Gujarat in the year 2005. Gujarat’s Vision 2020 now outlines an ambition for eight areas, including energy and power; education and skills development; gross state domestic product and per capita income; industry; transport; health care and social amenities; and tourism and investment promotion.\(^9\) For energy and power, there are three main cornerstones:

1. Enhance gas supplies through exploration and production.
2. Encourage power generation and become a trading hub for the West.
3. Encourage solar and wind energy generation.

The Vision 2020 for the oil and gas sector recognizes gas as “the preferred fuel of choice across the ever-expanding urban, industrial and transport landscape of Gujarat” and expects to double the per capita consumption of gas to reach upper middle-income levels and “exceed the world average.”\(^10\)

In 2004, a proactive measure by the Gujarat government reduced the sales tax on LNG from 20.5 percent to 12.5 percent. The move followed strong presences from gas and power producing companies in the state and immediately benefitted India’s first LNG terminal projects—Dahej and Hazira. It also helped in rationalizing a sales tax for gas consumed within the state, as transporting gas from Gujarat to other states attracted only a 4 percent sales tax. By comparison, consumers then had to pay more than 72 cents per million Btu as a sales tax, inclusive of transportation costs and marketing margins, which subsequently came down to 44 cents per million Btu.\(^11\) The reduction in taxes also led to industries switching from costly naptha to imported LNG and provided the necessary impetus for progress in the gas sector and the state government’s vision of a gas-based economy.

In 2017, the government of Gujarat issued an order regarding the reduction of the value added tax (VAT) rate on natural gas by 9 percent, which effectively reduced the applicable VAT rate on natural gas in the state from 15 percent to 6 percent.\(^12\) During the pre-Goods and Service Tax (GST) period, exporters of natural gas were able to avail input credit against the 15 percent VAT paid on the purchase of natural gas in Gujarat. However, since natural gas was not covered under the GST, the VAT paid on natural gas was not available as input tax credit against the GST liability on the related end product. Pursuant to the new order, the natural gas suppliers charge and collect tax at the rate of 6 percent on sales of natural gas from consumers in the state, except those purchasing natural gas for electricity generation or the manufacture of fertilizer.

Gujarat has kept a leading edge in the policy and regulatory domain by enacting key policies such as the Gujarat Port Policy in 1995 and Gujarat Solar Policy in 2009 and catering for open access in the gas pipeline business ahead of a similar focus at the national level. Gujarat State Petronet Limited (GSPL) is India’s first

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pipeline company operating on the common carrier principle of transmission. This allows the consumers and gas marketing companies to source and market their gas using the GSPL network and pay the required tariff charges.

In the 1990s, the state government led the development of Gujarat’s ports by developing the investor friendly Port Policy in 1995 and the BOOT (Build, Own, Operate and Transfer) policy in 1997, the first among Indian coastal states. The policy framework invited private operators to develop port services, a move away from the earlier venture investment model. Several other models were enacted to attract investments, resulting in major capacity additions. Pipavav developed the first private port in India in 1998, followed by a chemical plant in Dahej in 2001 and the LNG terminal in 2004. Gujarat has played a vital role in the maritime industry infrastructure development of India, with several other states following Gujarat’s policy framework in the subsequent years. Karnataka (1997), Kerala (2004), Tamil Nadu and Odisha (2007), and Maharashtra (2016) have subsequently announced maritime and port policies in India.

The pioneering port policy also led to port-linked development and the first operationalization of special economic zones (SEZs) in 2001. The state-of-the-art Kandla Special Economic Zone benefitted from proximity to the Kandla and Mundra port facilities. For decades, Gujarat has enabled an ecosystem for affordable and accessible energy and has pursued a holistic hub-based approach to development through SEZs. As of January 2020, Gujarat had 20 operational SEZs. In addition, Gujarat had four SEZs with valid in-principle approvals, 28 with formal approvals, and 24 with notified approval.

The positive governing environment has helped Gujarat achieve top status in terms of total area covered under SEZs in India. It is also the leading state in terms of new SEZ area under development. The zones receive a 10-year corporate tax holiday on export profits. Some of the largest SEZs include the Adani Port & Special Economic Zone Ltd., Reliance Jamnagar SEZ, and Sterling SEZ & Infrastructure Ltd.

Land acquisition for industrial and infrastructure development has always been a contentious subject. The proposed initiatives for industrial development in setting up SEZs, special investment regions (SIRs), and infrastructure projects such as power plants, ports, and roads require acquiring substantial quantities of land. Various laws and procedures allow a government to acquire land for such uses and for public purposes. Land records in Gujarat are maintained on a web-based platform ensuring transparency in land transactions.

**CASE STUDY: CLEARANCES IN RECORD TIME—DHOLERA SIR**

The Dholera SIR project was announced by the Gujarat government in May 2009, following the enactment of the SIR Act in January. The development project is the biggest node on the Delhi Mumbai Industrial Corridor, spanning 920 km\(^2\). The Dholera smart-city model witnessed an accelerated timeline, developing a master plan by May 2009 and receiving environmental clearance in September 2014, following the approval of development plan. The development is expected to sustain 2 million residents and 827,000 jobs.\(^\text{14}\)

In January 2020, the government of Gujarat launched the Gujarat Land Bank Portal to assist investors to search for land to set up industry in a transparent manner online.\(^\text{15}\) The land bank offers online details of available land at industrial sites including the Dholera SIR; petroleum, chemicals, and petrochemicals investment regions (PCPIRs); SEZs; private industrial parks; and logistics parks. The key features of this portal are the electronic Land Allocation System, an online GIS mapping and land allotment tool launched by the state government. It provides a single window access for allotment and possession of land within 90 days.

| Single window system and investor facilitation portal | Online system for labor compliances | Online system for environment compliances | Online system for tax/VAT registration, filing etc. |

In January 2019, the Gujarat government announced its land policy for renewable energy projects. The government allotted land for 30 GW of solar, wind, and solar-wind hybrid capacity. Out of the 30 GW, 10 GW worth of project land has been allotted to state-backed distribution companies. The remaining 20 GW worth of land is available for the state as well as nationally backed projects.\(^\text{16}\) This is welcome for wind developers in Gujarat who struggled to acquire land area with wind power potential at a reasonable price. This will protect projects from running into cost escalations and penalties payable on commissioning delays. Gujarat has also implemented a program called SWAGAT (State-Wide Attention on Grievances by Application of Technology), which enables the common citizens to take their problems to chief minister, the highest level of state government. This network uses Gujarat’s huge wide area network, which connects government offices. This is the largest internet protocol-based network in the Asia-Pacific region and the second largest in the world.

In addition to progressive policymaking, in some cases ahead of national policymaking timelines, the Gujarat judiciary has also been proactive by building environmental sensitivity through a December 1996 judgement of the Gujarat High Court. To control industrial pollution, the Gujarat High Court introduced the idea of setting up a third-party program for the most polluting plants.

**CASE STUDY: ENVIRONMENTAL ORDER CUTS POLLUTION—MORBI CLUSTER**\(^\text{17}\)

Morbi has become part of national folklore for being one of the largest industrial clusters in terms of single gas use. Morbi has around 1,000 operational ceramic tile units, and almost 70 percent of India’s tiles come from this cluster, contributing about $2 billion in annual export revenue, $6 billion in revenues, direct and indirect employment of more than 500,000 people, and support for 2,000 auxiliary units, including paper

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and packaging. Eighty percent of the sales from Gujarat Gas are to this cluster and have been supported by the expanding gas pipeline infrastructure since 2008. Apart from Morbi, there are five other major ceramic product clusters in India. Recently, this transition was further enabled by regulatory action when a National Green Tribunal (NGT) order in March 2019 directed for an immediate shutdown of all coal gasifiers (for roughly 550 units)\(^{18}\) and named Morbi as one of the most polluting clusters in India in November 2019 (due to the low compliance rate of switching from coal gasifiers). In addition to the judicial action of the NGT, the state government is supporting the adoption of natural gas, and Gujarat Gas is expanding its gas supplies to Morbi. Reflecting the play of economics in an unregulated gas consuming sector, upon this announcement and hence an increase in fuel costs, the wall tiles division of the Morbi Ceramic Association announced an increase in the price of tiles by 10 to 15 percent within one month of the NGT order. With gas accounting for 15 to 20 percent of the total cost for this sector, Gujarat Gas further improved the economics of the gas supply through key operational measures relating to providing flexibility in production planning on a monthly basis rather than daily basis, reduced interest rates on delayed payments, and a reduction in notice period to undertake manufacturing maintenance.

In 2009, the Gujarat government set up the Department of Climate Change, making it the first state in India, the first in Asia, and the fourth in the world to form a department focused on sustainable development and a climate resilient future\(^{19}\). The department provided the necessary boost for renewable power growth, the state-level policies for which had been enacted even earlier. The government provides a revolving fund for R&D development in green technologies and promotes green credit schemes within industries. The policymakers have taken specific initiatives in the power sector to reduce greenhouse gas emissions. It includes a vision to achieve 50 percent power from green projects and encourage gas usage in the transport, residential, and industrial sectors. Proactive reforms such as rationalization of tariff structures for renewable power projects and optimum utilization of existing plants helped the state become a power surplus state.

Through GIDB, the government of Gujarat has prepared a Sustainable Development Vision Document for the State of Gujarat—*Transforming Gujarat: The 2030 Vision for Sustainable Development*. The Sustainable Development Vision Document includes the existing targets and schemes of the state government for each department and the new targets and schemes which it would like to implement. Gujarat has envisioned the sustainable development goals of providing universal access to affordable, adequate, reliable, and modern sustainable energy. The vision document focuses on protecting, restoring, and promoting the sustainable use and management of all ecosystems. Gujarat has adopted the cleanest fossil fuel with proven capabilities and will continue to seek opportunities in advantaged sourcing and efficient distribution.

**Future Outlook**

Going forward, Gujarat has a role in writing India’s template for gas and renewable integration thanks to its gas-based economy and renewable rich state in terms of wind and solar resources. Gujarat is one of the five Indian states (in addition to Karnataka, Tamil Nadu, Rajasthan, and Andhra Pradesh) which are facing system integration challenges, as the share of renewables in the power capacity mix is nearly 25 percent. Gujarat is also one of the states where India is rolling out its Renewable Energy Management Centers. Further, the Ministry of Power’s Green Energy Corridor scheme will incentivize wind and solar developers to connect directly to these corridors in states such as Gujarat, with incentives including zero transmission charges until 2022.

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Despite Gujarat having established itself as a gas economy, there is still an untapped potential in gas-based power. Gujarat depends on coal for roughly 70 percent of its generation needs, while gas-based plants are underutilized, at 22 percent, close to renewables at 20 percent. In August 2018, the Central Electricity Authority suggested a plan to test its gas-fired fleet as “peakers” by operating only in the evening for supply smoothing and to deal with grid fluctuations.

Gujarat has set a 30 GW installed renewable capacity target for 2022, with 9.6 GW currently operational. This significant amount of intermittent renewable energy will require power markets to overcome issues related to load balancing and to ramp up support of power plants, requiring active measures and investment on the grid integration front. Gas is therefore projected to play an increasing role in meeting power demand reliably and efficiently. It offers versatility in terms of net load generation and ramping up support for other power generation sources. Gujarat, with its pre-existing expansive gas-related infrastructure, is in a great position to take a rapid lead on integrating large amounts of variable renewable energy into its grid at relatively low incremental firming costs.

Gujarat can consider an array of policies to support gas-renewable integration such as incentivizing flexibility, bringing in a carbon-price mechanism, building an environmental dispatch order, adding gas to the wind-solar hybrid policy, and introducing a capacity-based mechanism to support higher renewables penetration. These policies can be prioritized in terms of their relative impact and ease of adoption.

As a final step in its gas market evolution and development of an India-wide gas price marker, Gujarat has all the key success factors such as physical delivery point, access to infrastructure, and diversity of supply and demand to enable the building of a gas hub. In June 2020, the Indian Energy Exchange launched the Indian Gas Exchange, with two out of the three locations for contracts located in Gujarat, at Dahej and Hazira20. The implementation and success of this gas hub will depend upon the adoption of the gas hub by gas suppliers and consumers and whether liquidity can ramp up as a viable basis for future contracts.

The Gujarat government is working on an electric vehicle (EV) policy21, which is expected to be announced soon. As per the draft EV policy released in 2019, battery charging stations for EVs will be set up across the state. The Ahmedabad Municipal Corporation, entrusted with setting up charging stations, will become the first civic body in the country to provide facilities to charge EVs in its multi-level charging lots. The state is also exploring the possibility of local manufacturing of EVs and batteries in a specific manufacturing zone at the Dholera SIR. Attractive incentives, robust charging infrastructure, and local manufacturing capabilities are expected to combine to provide a massive boost to EVs in Gujarat.

The Delhi-Mumbai Corridor project will continue to support industrial growth in the SIRs and port development. Gujarat will need all forms on energy sources going forward to feed this growing demand. Gas is adequately placed to harness the growth in demand, and future enabling policy and regulatory measures are essential for federal policymakers to adopt.

## Appendix: List of Key Policies

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<tr>
<th>Timeline</th>
<th>Major Policy/Act Announcement (State-level)</th>
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<tr>
<td>1995</td>
<td><strong>Port Policy</strong>&lt;br&gt;It helped bring in private players to develop “best-in-class” port terminals through an enabling policy framework. This helped in opening up Gujarat's ports sector for privatization as well as in the development of various execution models for attracting investments. Gujarat was the first state to adopt a port policy, as well as a corresponding BOOT policy in 1997. Gujarat, Maharashtra, and Tamil Nadu were the only states to have a maritime board before the Ministry of Shipping advised coastal states to set them up to provide a major fillip to non-major ports.</td>
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<td>2002-2004</td>
<td><strong>SEZ Policy and SEZ Act</strong>&lt;br&gt;Under the act, assistance is provided for both the developers and co-developers of SEZs for development of infrastructure facilities and service provision. Tax concessions are provided to the units coming up in the SEZs. Additionally, the SEZ Rules, 2005 SEZ Regulations, and SEZs Amendment Act of 2007 are also in place.</td>
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<td>2004</td>
<td><strong>Gujarat State Mineral Policy</strong>&lt;br&gt;The policy aimed to explore opportunities in the mineral resources sector through enhanced efficiency by adopting e-governance.</td>
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<td>2009</td>
<td><strong>Solar Power Policy</strong>&lt;br&gt;The policy aimed at the promotion of green and clean power, created an appropriate investment climate, and promoted local manufacturing facilities. Gujarat's solar policy pre-dates the National Solar Mission, which was launched in 2010.</td>
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<td>2009</td>
<td><strong>Power Generation Policy</strong>&lt;br&gt;This policy aimed to develop Gujarat as a power-generation hub and to provide adequate power for different sectors.</td>
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<tr>
<td>2009</td>
<td><strong>Gujarat Industrial Policy</strong>&lt;br&gt;This policy aimed to facilitate investments in the state, generate employment, and adhere to high quality standards.</td>
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<td>2010</td>
<td><strong>Shipbuilding Policy</strong>&lt;br&gt;This policy aimed to enhance industrial growth in the state by encouraging the establishment of shipbuilding and downstream ancillary industries.</td>
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| 2013, 2018, 2019| **Wind Power Policy**<br>The policy promotes wind power growth along the state’s 1,600 km coastline.  
**Wind-Solar Hybrid Policy**<br>The policy promotes large grid-connected wind-solar PV hybrid systems for optimal and efficient utilization of transmission infrastructure.  
**Land Policy for Renewable Projects**<br>This policy aims to set up wind and wind-solar hybrid parks, the first by any state, in a total area which can accommodate 30 GW of renewable energy |
| 2014-2019      | **E-Governance Policy**<br>This effort aims to broaden the scope of e-governance and provide cost efficient services through information and communication technologies. |
| 2014-2019      | **IT Policy**<br>This policy aims to attract IT companies to Gujarat worth $15 billion by 2020. |
| 2015           | **Gujarat New Industrial Policy**<br>This policy aims to develop Gujarat as a global manufacturing hub and induct more entrepreneurial and skill development processes to support the Make in India initiative. |

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