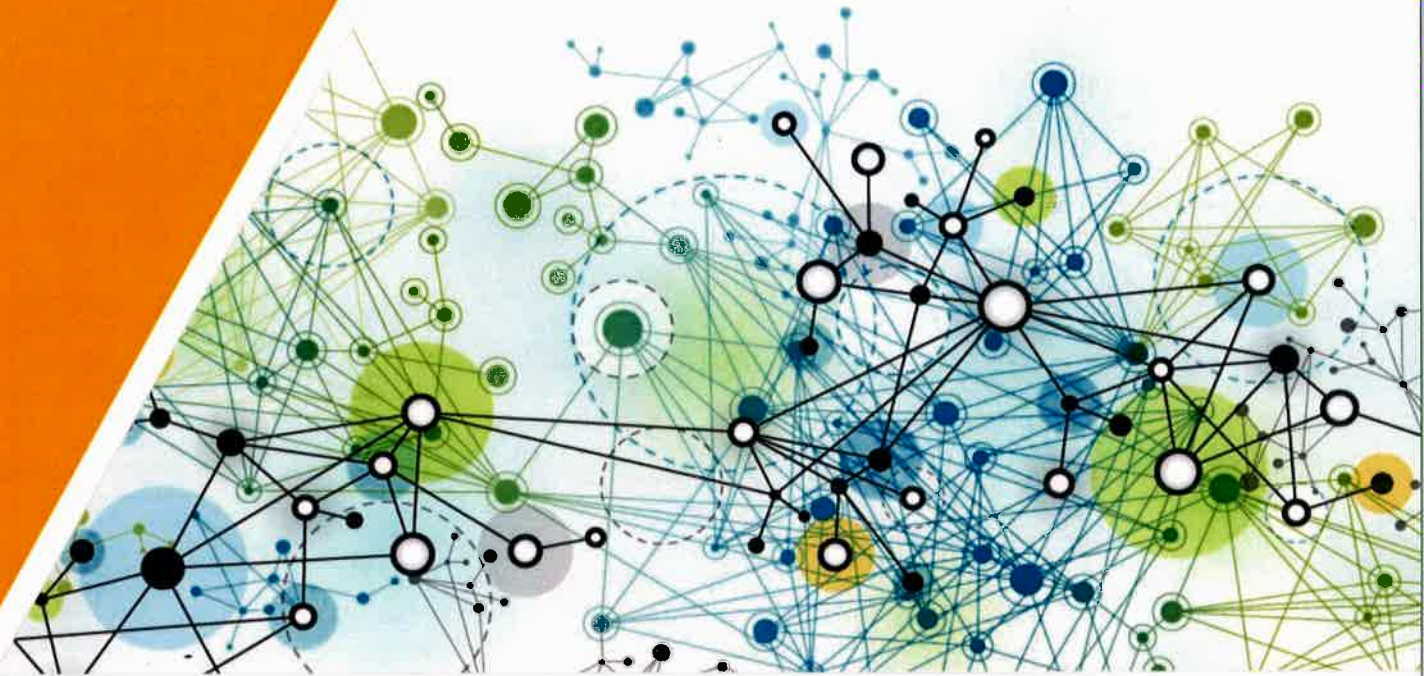




2020-21

NETWORK PLANNING REPORT



State Transmission Utility (STU) Plan on Transmission Sector in Gujarat

Perspective Plan upto 2024-25 & Onwards

Status upto March-2021/GETCO/STU/Report
dated 18.06.2020



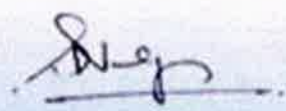
GUJARAT ENERGY TRANSMISSION CORPORATION LIMITED

Vadodara (INDIA)

QUALITY POLICY

We as transmission utility in Gujarat are committed to system availability, minimize transmission losses and continual improvement in our transmission services through grid discipline and safe operation, thereby exceeding customer, stake holder's expectations, protect environment, achieve Global recognition and build robust, reliable and optimum transmission system by adopting latest prevailing technology and project management practices.

Date : 12th February 2008


Managing Director



From Desk of the Managing Director



Greetings...!!

India has an ambitious renewable energy capacity expansion program to 175 GW by 2022, in which Gujarat has been front runner. The State contributes 13 percent to India's renewable energy basket. This year, Gujarat's total renewable capacity has crossed 10 GW mark. Further, the state has the highest solar roof top installations in the country which adds up to about 1000 MW.

Also, the push of central as well as state government has proven to be a game changer for renewables. It has infused enthusiasm in the industries and developers and promoted clean energy development.

Even during such an uncertain time of Covid-19, GETCO has fulfilled the mission of maintaining grid stability and reliability throughout the year. With our constant efforts, we have achieved 99.51% of Transmission line availability and 99.89% of substation availability during 2020-21. Further, to keep pace with state's growing power demand and ensure reliable power supply, during 2020-21, addition of 1993 CKm line length and 4757 MVA of transmission capacity is added to boost up our Gujarat Power system.

Further, with the launch day time power supply to agriculture sector under Kisan Suryoday Yojna (KSY), power demand of the State is expected to grow exponentially. To meet this demand, GETCO has charted an ambitious capacity addition plan in phase wise manner up to 2022-23 and its implementation work is under progress. However, around 4000 villages are already implemented KSY scheme.

The network planning report of STU is prepared with an aim to brief all our stakeholders about the present and planned transmission infrastructure of GETCO, existing and anticipated energy scenario of our state, renewable energy integration etc.

We hope this report will bring better understanding of Gujarat transmission network planning and expect constructive feedback from all our stakeholders.

Best Regards,

Shri Upendra Pande
Managing Director
Gujarat Energy Transmission Corporation Limited



From The STU Cell



A decade down the line, Gujarat's net power generation capacity from 13600 MW in 2010 to 30244 MW in 2021 has increased by 55%. In terms of Renewables, from meagre 13% of installed capacity in 2010 it has now reached to 32% in 2021.

The Capacity addition slowed down temporarily in 2020 due to Covid Pandemic but the fact is that today 9797 MW (32%) of renewables have been installed in Gujarat grid against 1782 MW (13%) at the beginning of the decade.

Further, three large scale solar parks i.e. Dholera Solar Park (1000 MW), Raghnesda Solar Park (700 MW) & Harshad Solar Park (500 MW) have been sanctioned in the state. Around 7000-8000 MW capacity of RE is already granted to various developers and is expected to be commissioned during 2021-22-23. In terms of ISTS RE schemes in Gujarat, world's largest renewable energy park of 30 GW at Khavda, Kutch has been sanctioned. Implementation of the Hybrid RE park will be in Phase wise manner and transmission schemes for Phase -1 of 8 GW (by 2023) has been finalized.

For smooth integration and evacuation of huge RE capacity as well as provide quality and uninterrupted power supply to our esteemed consumers, GETCO is dedicatedly focusing on having adequate transmission network and transmission capacity at all voltage levels.

The Network Planning Report has covered various aspects of GETCO and gives outlook on our future projects.

Shri Narendrakumar P Jadav
Chief Engineer (STU Cell and R&C)
Gujarat Energy Transmission Corporation Limited



From The STU Cell



The State of Gujarat continues to aggressively pursue its effort towards a cleaner energy portfolio. With huge anticipated capacity addition of Renewables into the Gujarat Grid along with agricultural demand shift during day time with implementation of Kisan Suryoday Yojana, GETCO as a State Transmission Utility is responsible for development of efficient and coordinated Intra-state transmission system for smooth flow of electricity from Generating plants to its consumers.

Transmission planning is a continuous process of identification of transmission system addition requirements, their timing and need. The key inputs for our planning are new Generation units' addition in the system, Load demand forecast from DISCOMs, operational constraints, system strengthening in order to increase reliability in the grid.

For transmission planning and analysis, Load flow studies and Short circuit studies are carried out through the use of prominent software's like Mi-Power and PSS/E.

We are pleased to present the Network Planning Report of State Transmission Utility (STU) on Transmission Sector of Gujarat for the financial year 2020-21. The Report covers the Present & Planned Infrastructure of GETCO grid, Capacity addition for next 5 years in terms of Transmission lines, Substation, Transformation Capacity, Highlights of RE sector, Operational, Financial and Physical performance of GETCO.

We convey our hearty thanks to all stakeholders for their support and kind co-operation.

Smt Alka S Shah
Superintending Engineer (STU Cell)
Gujarat Energy Transmission Corporation Limited



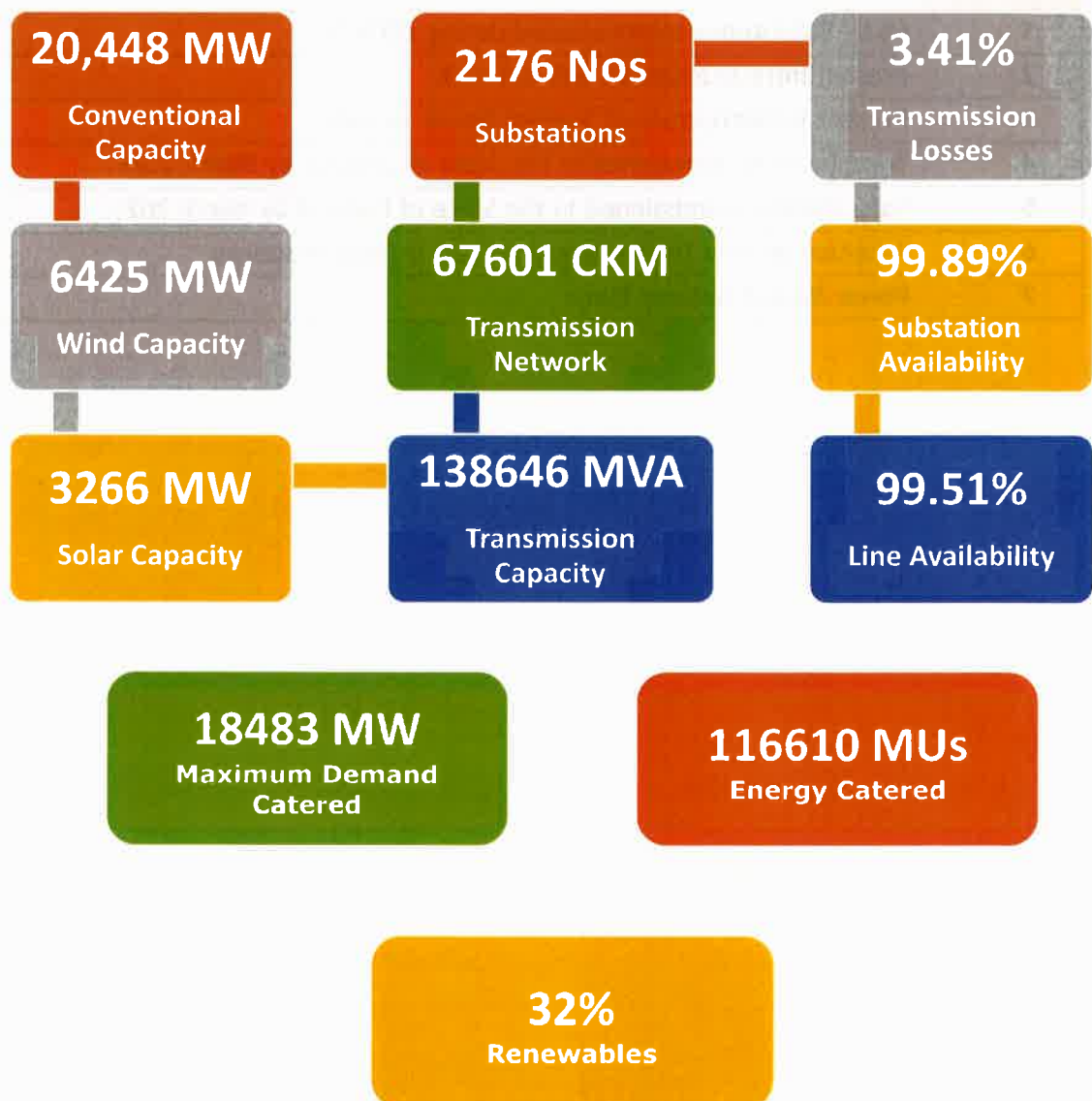
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Key Highlights of Gujarat Grid





1. Introduction

1.1 Company Profile - About GETCO:

Gujarat Energy Transmission Corporation Ltd (GETCO) was formed in 1999 and was registered under the Companies Act, 1956 as a part of the power sector reforms process in the state. The Company was promoted by erstwhile Gujarat Electricity Board (GEB) as its wholly owned subsidiary in the context of liberalization and as a part of efforts towards restructuring of the Power Sector. The company commenced commercial operation with effect from 1st April 2005.

As a part of the ongoing reforms process in the state power sector, in the year 2003, the Government of Gujarat under the provisions of Gujarat Electricity Industry (Re-Organization & Regulation) Act, 2003 framed the Gujarat Electricity Comprehensive Transfer Scheme, 2003 (the Transfer Scheme) vide Government Notification No: GHU-2003-58-GEB-3537-K dated the 24th October, 2003. The Government of Gujarat issued Notification No. GHU-2004-99-GEB-1104- 7318-K dated the 31st December 2004, notifying the Provisional Opening Balance Sheet as on 31st March 2004 of the Six Transferee Companies containing the value of assets and liabilities transferred from erstwhile Gujarat Electricity Board (GEB) to the Transferee Companies. Assets of the Board were dis-aggregated into six companies - One each in Generation and Transmission and Four in Distribution.

A holding company, Gujarat Urja Vikas Nigam Limited (GUVNL), has also been formed. Apart from co-ordination functions, GUVNL is also handling Trading and Bulk Supply functions.

Organizational development and strengthening are the other areas into which the management of GETCO is looking into to transform GETCO into a commercially viable vibrant organization. Apart from internal reforms - institutional strengthening and organizational development - GETCO is also gearing up to meet the regulatory challenges, both in terms of operational efficiency and commercial & financial implications of the same.



Gujarat Energy Transmission Corporation Limited

Further, GETCO was notified as State Transmission Utility (STU) by Government of Gujarat vide Notification No.GHU-04-31-GEB-1104-2946-K Dated 29th May 2004 with the purpose of improving efficiency in the state's electricity transmission activities.



1.2 Role of STU:

As per Section 39 of Electricity Act, 2003, functions of STU are -

- (a) To undertake transmission of electricity through intra state transmission system.
- (b) To discharge all functions of planning and coordination relating to intra state transmission system with
 - (i) Central Transmission Utility
 - (ii) State Governments
 - (iii) Generating Companies
 - (iv) Regional Power Committees
 - (v) Authority
 - (vi) Licensees
 - (vii) Any other person notified by the State Government in this behalf.
- (c) To ensure development of an efficient, coordinated and economical system of intra state transmission lines for smooth flow of electricity from a generating station to the load centers.



- (d) To provide nondiscriminatory open access to its transmission system for use by
- (i) any licensee or generating company on payment of transmission charges; or
 - (ii) any consumer as and when such open access is provided by the State Commission under sub-section (2) of section 42, on payment of the transmission charges and a surcharge thereon, as may be specified by the State Commission.

1.3 Objective:

- (a) To undertake planning and co-ordination of activities of transmission, load dispatch functions in the State of Gujarat.
- (b) To study, investigate; collect information and data etc. for Research & Development.
- (c) To plan, acquire, establish, construct, erect, lay, operate, run, manage, maintain, enlarge, alter, renovate, modernize, work and use a Power System network in all its aspects and extra- high voltage (EHV), high voltage (HV) lines and associated substations, including cable wires, accumulators, plants, motors, meters, apparatus, computers and materials connected with transmission, supply of electrical energy, communication and tele-metering equipment, to undertake for and behalf of others, the erection, operation, maintenance, management of extra high voltage, high voltage lines and associated substations, equipment, apparatus, cables and wires.

1.4 Operational Profile:

GETCO started functioning as an independent company from 1st April 2005 with following major activities -

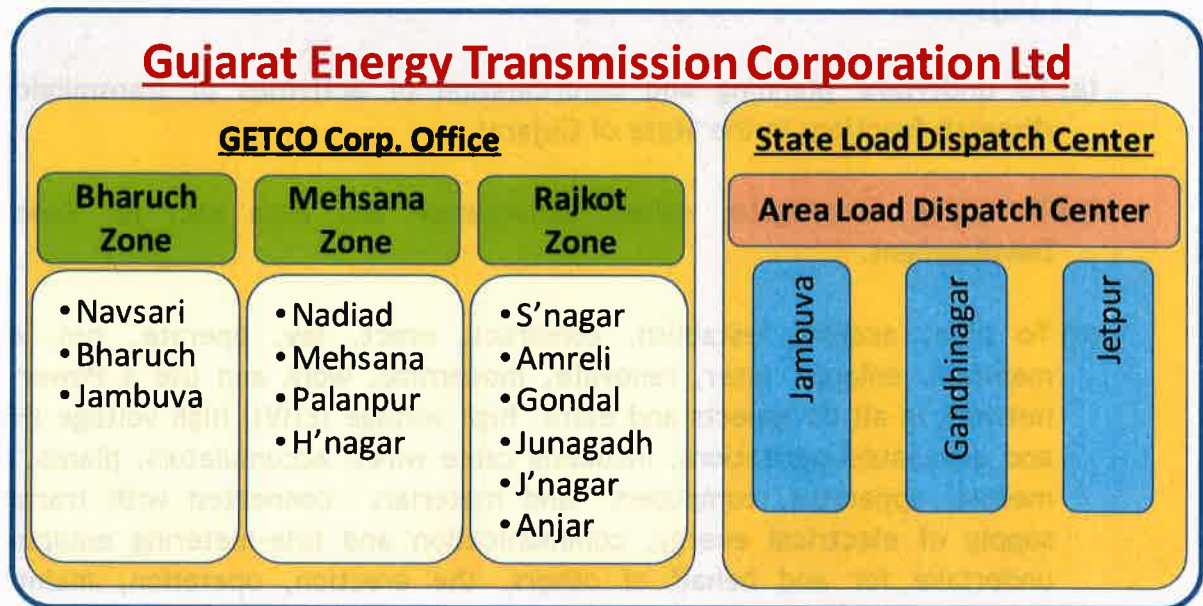
- State Transmission Utility
- Transmission Licensee
- State Load Dispatch Center

The bulk power generated at various generating stations in the state and the share of power generated by Central Sector Stations is transmitted to Distribution Companies at various interface points in the State through an extensive network of 400 kV, 220 kV, 132 kV and 66 kV transmission lines and substations. GETCO carries energy to all the four distribution companies in the state and other distribution licensee which in turn supply power to more than 1.62 Crores consumers across the state.



The company is organized into 13 circles. Each circle has separate construction and operation & maintenance divisions that handle respective tasks. The Construction Divisions are established for construction of new substations and lines along with EHV augmentation and link lines, while the transmission divisions are established for operation, maintenance and augmentation of the existing substations and lines.

Further, State Load Dispatch Center at Gotri with sub-LDC's at Gandhinagar, Jambuva & Jetpur has to ensure integrated operation of the power system in the state.





2. Gujarat Network – Power Scenario & Transmission Infrastructure

2.1 Net Generation Capacity Addition:

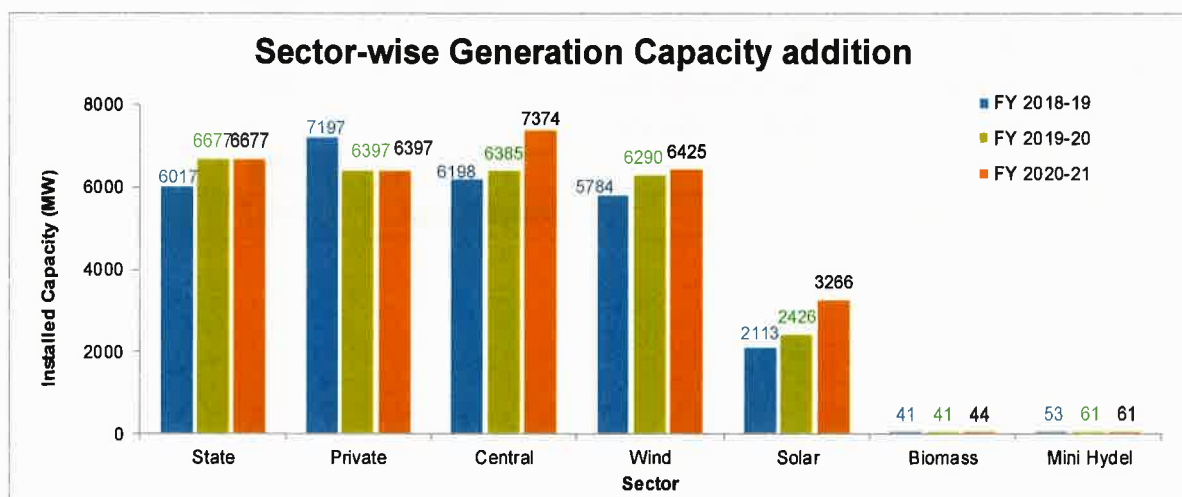
The generation capacity addition during the year 2020-21 is as under:

(Source: SLDC)

Sr. No.	Sector	Available Capacity in MW		
		As on 01.04.2020	Net Addition* during April-2020 to March-2021	As on 31.03.2021
1	State	6677	-	6677
2	Private	6397	-	6397
3	Central Sector	6385	989	7374
Total (1)...		19459	989	20448
4	Wind	6290	135	6425
5	Solar**	2426	840	3266
6	Biomass	41	3	44
7	Mini Hydel	61	-	61
Total (2)...		8819	978	9797
Grand Total...		28278	1967	30244

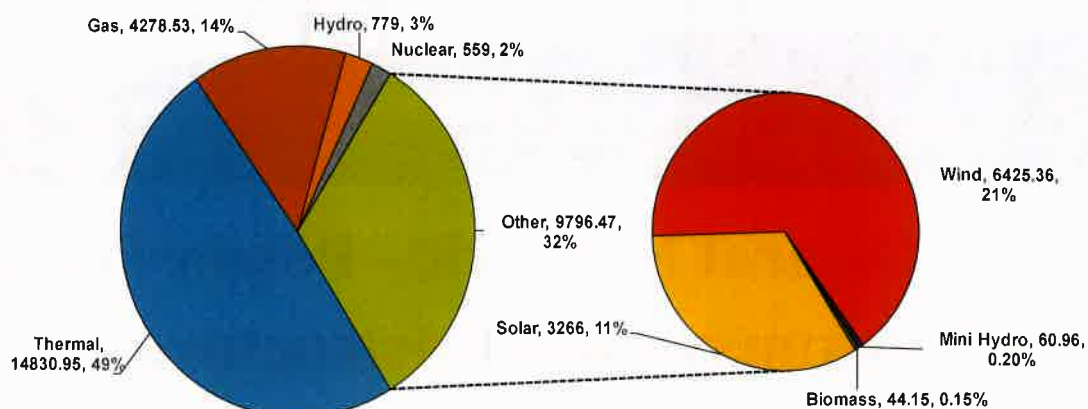
Note: (1) *Net addition during the year considering commissioning of plants

(2) **Installed Solar Capacity is excluding Roof Top solar capacity.





Fuel wise Installed Capacity as on 31.03.2021



2.1.1 Details regarding net Generation capacity addition during the year:

Sr. No.	Sector	Month	Name of Generating station	Gujarat Share in MW	Remarks (Capacity Addition/Deduction)
1	State	--			
2	Private	--			
3	Central	April-20	Khargone STPP	123	Unit -2 (800 MW) commercial
		Nov-20	Lara STPP	78	Unit -2 (800 MW) commercial
		Feb-21	Kota STPS	25	Unit-7 (GUVNL PPA - 5 years)
		Feb-21	Farakka	25	Unit-3 (GUVNL PPA - 5 years)
		Mar-21	Gadarwara	152	Unit-2 (800 MW) commercial
		Mar-21	Reallocation of power to Government of Gujarat	586	Out of surrendered share of beneficiaries of various power stations of NTPC
Total..(3)				989	
4	Non Conventional Sources	Wind Generation		135	
		Solar Generation		840	
		Biomass Generation		3	
Total..(4)				978	
Grand Total..				1967	



2.2 Transmission Network addition:

The transmission network addition during the year 2020-21 is as under:

Sr. No.	Voltage Class	As on 31.03.2020		Addition during the year 2020-21		As on 31.03.2021	
		Substation (Nos.)	Transmission Lines (CKm)	Substation (Nos.)	Transmission Lines (CKm)	Substation (Nos.)	Transmission Lines (CKm)
1	400 kV	16	6096	2	150	18	6246
2	220 kV	105	20478	8	443	112 [#]	20921
3	132 kV	58	5566	-	110	57	5676
4	66 kV	1845	33468	143	1290	1989*	34758
Total...		2024	65608	153	1993	2176	67601

Note: (*) one 33 kV substation included, (#) existing 220 kV Bhachunda is upgraded to 400 kV level and hence, 1 nos of s/s reduced from 220 kV S/s.

Sr. No.	Voltage Class	As on 31.03.2020	Addition during the year 2020-21	As on 31.03.2021
		Transformation Capacity in MVA		
1	400 kV	19765	- [#]	19765
2	220 kV	41765	1295	43060
3	132 kV	10853	322	11175
4	66 & 33 kV	61506	3140	64646
Total...		133889	4757*	138646

Note: (*) 4757 MVA includes 2587 MVA transformation capacity from new substations and 2170 MVA from augmentation of existing transformation capacity. (#) 400/220 kV ICTs are erected and yet to be commissioned.

2.2.1 Transmission Network commissioned during year 2020-21:

2.2.1.1 400 kV Transmission lines:

Sr No.	Month	Transmission Line	Length (CKm)
Note: 150 CKm stringing for 400 kV Transmission line corridor completed in the year 2020-21 which are under progress transmission lines.			

2.2.1.2 220 kV Transmission lines:

Sr No.	Month	Transmission Line	Length (CKm)
1	Jul-20	LILO of one circuit of 220 kV Achhalia - Jambuva at 220 kV Vyankatpura	72
2	Sep-20	LILO of 220 kV S/C Wanakbori - Asoj line and 220 kV S/C Wanakbori - Vyankatpura line at 220 kV Sevalia	23
3	Sep-20	220 kV D/C Asoj - IOCL	65
4	Nov-20	LILO of 220 kV S/C Vallabhipur - Vartej at 220 kV Maglana	8.5
5	Nov-20	220 kV D/C Palanpur - Amirgadh DFCC line [Balance work]	80
6	Nov-20	220 kV D/C Jambuva - Waghodia (PGCIL)	68
7	Dec-20	220 kV D/C Bhogat - Bhatia line	26
8	Dec-20	LILO of one circuit of 220 kV D/C Ukai - Achhalia line no. 3 at 220 kV Virpore	69
Overall			412
Note: 443 CKm stringing for 220 kV Transmission line corridor completed in the year 2020-21 which are under progress transmission lines and above commissioned transmission lines			



2.2.1.3 132 kV Transmission lines:

Sr No.	Month	Transmission Line	Length (CKm)
1	Jun-20	LILO of 132 kV S/C Junagadh - Talala line at 220 kV Shapur	24.5
2	Dec-20	132 kV D/C Tilakwada - Dadhoi TSS	59
Overall			83.5
Note: 110 CKm stringing for 132 kV Transmission line corridor completed in the year 2020-21 which are under progress transmission lines and above commissioned transmission lines			

2.2.1.4 66 kV Transmission lines:

Sr. No.	Details of Transmission Line	Addition during the year 2020-21 (Length in CKm)
1	Lines connected with new substations, link lines, R&M and Deposit Work	1289.5

2.2.2 Substations addition:

Sr. No.	Voltage Class	Addition during the year 2020-21				Total
		DGVCL	MGVCL	UGVCL	PGVCL	
1	400 kV	-	-	1	1	2
2	220 kV	2	1	1	4	8
3	132 kV	-	-	-	-	-
4	66 kV	38	21	21	63	143
Total...		40	22	23	68	153

(Note: Details of 66 kV Substation commissioned from April-2020 to March-2021 is attached as Annexure-1)

Sr. No.	Voltage Class	Name of Substation
1	400 kV	400 kV Bhachunda
2		400 kV Pachham (Moti Vavdi)
3	220 kV	220 kV Gothan
4		220 kV Rupkheda (Zalod)
5		220 kV Virpore (Vyara)
6		220 kV Barejadi (Gatrad)
7		220 kV Babara (Charkha)
8		220 kV Mesanka (Gariyadhar)
9		220 kV Selavadar (Talaja)
10		220 kV Wankaner (upgradation from 132 kV)



2.2.3 Substation Augmentation:

2.2.3.1 Capacity augmentation in MVA and Nos.:

Sr. No.	Voltage Class	During the year 2020-21	
		Capacity Addition in MVA	Capacity Addition in Nos.
1	400/220 kV	-	-
2	220/132 kV	50	1
3	220/66 kV	470	4
4	132/66 kV	380	7
5	132/11 kV	-	-
6	66/22/11 kV	1270	137
Total		2170	149

Sr. No.	Name of Substation	(Figures in MVA)		
		Existing Capacity	Capacity Augmentation	Capacity after augmentation
220/132 kV ICTs				
1.	220 kV Gondal	2x150+1x100	50	3x150
Total			50	
220/66 kV ICTs				
1.	220 kV Visavadar	1x100+2x50	100	2x100 + 2x50
2.	400 kV Asoj	1x100	160	1x160 + 1x100
3.	220 kV Bhilad	2x100	160	2x100 + 1x160
4.	220 kV Kansari	2x100	50	2x100 + 1x50
Total			470	
132/66 kV ICTs				
1.	132 kV Bhayavadar	2x50+1x20	30	3x50
2.	132 kV Sitagadh	50	50	2x50
3.	132 kV Jasdan	100+2x50	50	2x100 + 1x50
4.	132 kV Vaghasiya	1x50+1x100	50	2x100
5.	132 kV Padvala	1x100+1x50	50	2x100
6.	132 kV Tankara	50+100	50	2x100
7.	132 kV Dhrol	3x50	100	2x100 + 1x50
Total			380	



2.3 Reactive Power Compensation:

2.3.1 Shunt Reactor addition:

The shunt reactor addition during the year 2020-21 is as under:

Sr. No.	Voltage class	Installed Capacity in MVAR					
		As on 31.03.2020		Addition during the year 2020-21		As on 31.03.2021	
		Bus Reactor	Line Reactor	Bus Reactor	Line Reactor	Bus Reactor	Line Reactor
1	400 kV	2216 (27 Nos.)	841 (15 Nos.)	125 (1Nos)	-	2341 (28 Nos)	841 (15 Nos.)
2	220 kV	425 (17 Nos.)	-	75 (3 Nos)	-	500 (20 Nos.)	-
Total		2641	841	200	-	2841	841

2.3.1.1 Population of Shunt Reactors as on 31.03.2021:

Sr. No.	Name of Substation	Existing Reactor	
		Bus Reactor	Line Reactor
1	400 kV Asoj	50 MVAR	(1) 50 MVAR each on Asoj-Indore lines 1 and 2.
2	400 kV Amreli	225 MVAR (50 + 125+ 50)	-
3	400 kV Jetpur	113 MVAR (50 + 63)	-
4	400 kV Kasor	175 MVAR (50 + 125)	(1) 50 MVAR each on Kasor-Rajgarh line 1 and 2.
5	400 kV Chorania	175 MVAR (50 + 125)	(1) 50 MVAR on Chorania - Kosamba line (2) 50 MVAR on Chorania - Sanand line.
6	400 kV Soja	130 MVAR (50 + 80)	-
7	400 kV Zerda	175 MVAR (50 + 125)	1)63MVar on Charanka-Kansari-1 Line (2)63MVar on Charaka-Kansari-2 Line
8	400 kV Vadavi	175 MVAR (50 + 125)	-
9	400 kV Hadala	175 MVAR (50+125)	(1) 63 MVAR on Adani-Hadala line
10	400 kV Varsana	175 MVAR (50+125)	-
11	400 kV Kosamba	80 MVAR	(1) 63 MVAR on Kosamba - Sanand line (2) 63 MVAR on Kosamba - Chorania line
12	400 kV Mansar	63MVAR	-
13	400 kV Charanka	125 MVAR	-
14	400 kV Sanand	125 MVAR	-
15	400 kV Jetpur	-	63 MVAR Mundra Line 1
16	400 kV Jetpur	-	63 MVAR Mundra Line 2



17	400 kV Kasor	-	50MVAR Amreli Line 1
18	400 kV Veloda	80 MVAR	-
19	400 kV Amreli	50 MVAR	-
20	400 kV Kasor	-	50MVAR Amreli Line 2
21	400 kV Vav	125 MVAR	-
22	220 kV Anjar	25 MVAR	-
23	220 kV Nanikhakhar	25 MVAR	-
24	220 kV Nakhatrana	25 MVAR	-
25	220 kV Panandhro	25 MVAR	-
26	220 kV Jamnagar	25 MVAR	-
27	220 kV Dhokadava	25 MVAR	-
28	220 kV Sardargadh	25 MVAR	-
29	220 kV Halvad	25 MVAR	-
30	220 kV Kapadvanj	25 MVAR	-
31	220 kV Ranasan	25 MVAR	-
32	220 kV Visavadar	25 MVAR	-
33	220 kV Viramgam	25 MVAR	-
34	220 kV Deodar	25 MVAR	-
35	220 kV Tharad	25 MVAR	-
36	220 kV Otha	25 MVAR	-
37	220 kV Bhutiya	25 MVAR	-
38	220 kV Motipaneli	25 MVAR	-
Commissioned during 2020-21			
39	400 kV Pachham	125 MVAR	-
40	220 kV Nakhatrana	25MVAR	-
41	220 kV Vondh	25 MVAR	-
42	220 kV Bhatia	25 MVAR	-
Total		2841 MVAR	841 MVAR

2.3.2 Shunt Capacitor addition:

The shunt capacitor addition during the year 2020-21 is as under:

Sr. No.	Voltage class	Installed capacity in MVAR		
		As on 31.03.2020	Addition during the year 2020-21	As on 31.03.2021
1	132 kV	216	-	216
2	66 kV	1718	-	1718
3	22 kV	73	-	73
4	11 kV	3938.5	-	3938.5
Total		5945.5	-	5945.5



2.4 The present infrastructure of ISTS in terms of transmission lines, substations and transformation capacity in Gujarat: (Source: PGCIL)

2.4.1 The network of ISTS Transmission System:

Sr. No.	Particulars	Sub Stations (Nos.)	Transformation Capacity (MVA)	Transmission Line Network (CKm)
1	765 kV	3	9000	1771
2	400 kV	5	7465	8316
3	220 kV	-	-	1434
Total		8	16465	11521

The detailed present infrastructure of ISTS network is attached as Annexure -2

2.5 The present infrastructure M/s Torrent Power in terms of transmission lines, substations and transformation capacity in Gujarat: (Source: Torrent Power)

2.5.1 The network of Transmission System on M/s Torrent Power:

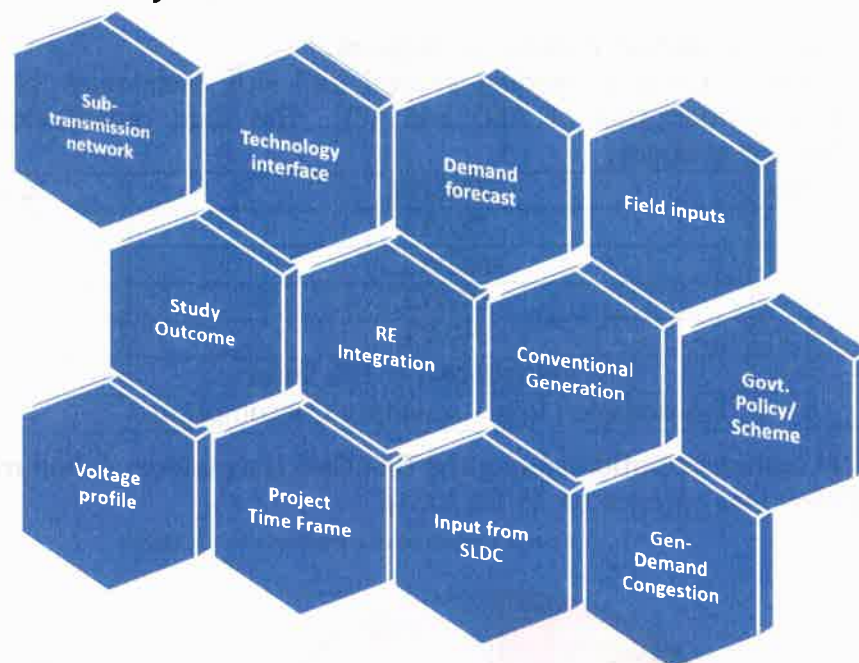
Sr. No.	Particulars	Sub Stations (Nos.)			Transformation Capacity (MVA)			Transmission Line Network (CKm)		
		TPL Ahm	TPL, Surat	TPL, Dahej	TPL Ahm	TPL, Surat	TPL, Dahej	TPL Ahm	TPL, Surat	TPL, Dahej
1	400 kV	2	-	-	2205	-	-	469	-	-
2	220 kV	1	4	1	620	1440	150	25	258	3
3	132 kV	17	-	-	3967.5	-	-	183	-	-
4	66 kV	-	-	-	202	-	-	43	-	-
Total		20	4	1	6792.5	1440	150	677	258	3

The detailed infrastructure of Torrent Power network is attached as Annexure -3



3. Parameters Considered for Transmission Planning of GETCO Network

The key drivers for taken into account while formulating Transmission plan of GETCO grid for next 5 years is as under -



- Assessing short & long term demand forecast of different regions based on nature and growth of load. Demand projections submitted by DISCOMs.
- New Conventional Generation Capacity Addition in the state. Data submitted by GUVNL.
- Identifying areas/locations for capacity addition, improving voltage profile, making system redundant.
- Input from SLDC regarding real time grid issues and constraints.
- Power flow from ISGS through ISTS network.
- Integration of Renewable energy



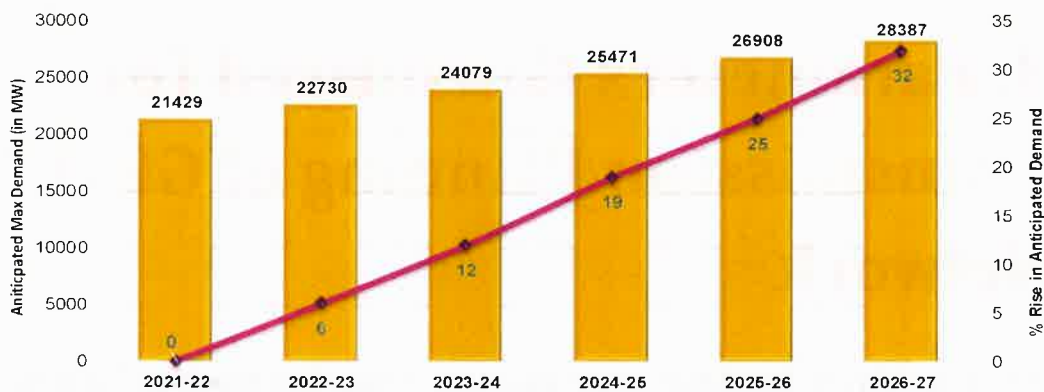
3.1 19th EPS report data:

As per 19th Electric Power Survey report by CEA, New Delhi the peak demand for Gujarat state up to 2023-24 is anticipated as 24079 MW.

With respect to present peak demand, around 27% rise is anticipated in next 5 years (up to 2024-25) whereas 42% rise is anticipated in next 7 years (up to 2026-27).

(source: 19th EPS Report)

Anticipated Demand Growth Up to 2027

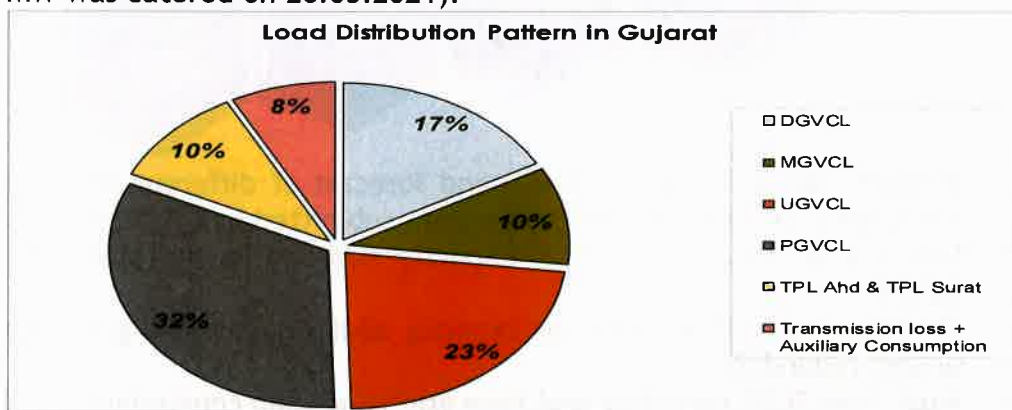


3.2 Load Distribution Pattern in Gujarat:

At present, GETCO is feeding around 347 MUs (Maximum 397 MUs) energy daily including consumption of AEC and SEC. The load distribution patterns for four DISCOMs are as under: (Source: SLDC)

Sr. No.	DISCOM	% Load Demand
1	DGVCL	17-18%
2	MGVCL	10-12%
3	UGVCL	22-24%
4	PGVCL	32-33%
5	TPL Ahmedabad & TPL Surat	10-11%
6	Transmission loss + Auxiliary Consumption	7-8%

Typical load distribution among the DISCOMS is as under: (when maximum demand 18483 MW was catered on 26.03.2021).



The above pattern throws a challenge to GETCO for planning 66 kV network keeping in view cost optimization of network and line losses.



3.3 Generation Capacity Addition in Gujarat:

The year wise anticipated generation capacity addition under State, Private and Central Sector in Gujarat State upto year - 2025 is as under:

(Source: GUVNL)

Sr. No.	Year	Generation Capacity (MW)				Total	Total Capacity at the end of the Year (MW)
		State Sector	Private Sector	Central Sector*	Renewable		
1	2020-21^	6677	6397	7374	9797	30244	30244
Anticipated Net Generation Capacity Addition (MW)							
2	2021-22	-	-	-	3572	3572	33816
3	2022-23	-	-	-	4147	4147	37963
4	2023-24	-	-	-	2476	2476	40439
5	2024-25	-	-	-	1516	1516	41955
Total		-	-	-	11711	11711	
Grand Total		6677	6397	7374	21508	41955	

Note - (*) For Central Sector projects, only share of GUVNL is considered, (^) installed capacity considered as SLDC data,

- Renewable Capacity addition planning excludes capacity to be added by Private Entities, under wheeling etc.
- Approx. 5000 MW Hybrid Capacity at Khavda RE Park is planned to be added by 2024
- The above capacity addition planning is on indicative basis only and not for the purpose of transmission capacity augmentation & for MW loading purpose for transmission tariff

3.3.1 Renewable generation addition:

Sr. No.	Year	Anticipated Capacity Addition (MW)			
		Wind	Solar	Others (Biomass, Waste to Energy, Mini Hydel)	Total
1	2021-22	100	3405	67	3572
2	2022-23	-	4097	50	4147
3	2023-24	-	2450	26	2476
4	2024-25	500	1000	16	1516
Total		600	10952	159	11711

Note:

- Above capacity planning is anticipated based on projects under various Tenders, Schemes etc. and is contingent to participation thereunder
- *Approx. 5000 MW Hybrid Capacity at Khavda RE Park is planned to be added by 2024



3.3.2 Projects to be de-commissioned (Capacity in MW):

Sr. No.	Name of Project	Sector	2021-22	2022-23	2023-24	2024-25	Total
1	GSEG Hazira	State IPP	-	156	-	-	156
Total			-	156	-	-	156

3.3.3 Uncertain Projects under State, Private & Central Sector:

Sr. No.	Name of Project	Sector	Capacity (MW)	Remark
1	NPCIL Kakrapar Expansion Unit 3 & 4	Central	476	Project is delayed and issue of cost overrun/high tariff
Total			476	



3.4 Load Growth:

(Source - As provided by DISCOMs)

Name of DISCOM	Load expected (in MW) by					
	Max Load recorded 2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
State sector						
DGVCL	3757	4409	4976	5617	6340	-
MGVCL	2087	2462	2585	2713	2848	-
UGVCL	4314	4688	4985	5301	5636	5993
PGVCL	5956	6133	6501	6892	7306	7745
Private sector						
TPL Ahmedabad	1578	1735	2139	2267	2402	2547
TPL Surat	623	709	723	738	752	768
TPL Dahej	78	84	88	91	93	95
Torrent (As whole)	2279	2528	2950	3096	3247	3410
Total	18393	20220	21997	23619	25377	

3.5 System study by STU:

Transmission network system study is required for operation of system under existing condition as well as its improvement and future expansion. Study is carried out by way of load flow study, short circuit study etc.

The load flow study helps to determine the best location as well as optimal capacity of proposed generating station and sub-stations with new lines at minimum transmission loss. It also suggests improvement to the existing system.

The load flow study also indicates real power, reactive power, and voltage magnitude and phase angle. With the help of system study, the requirement of additional transmission lines / transformers to avoid over loading of existing system, lines for evacuation of power etc. are decided to find most techno economic solution.

The short circuit study is carried out for designing circuit breaker ratings and providing adequate protective scheme of electrical power system based on fault levels.

System study also reveals and indicates low voltage pockets and requirement of compensating reactive power. It also shows voltage profile and transmission losses which are the major parameters that can be known with their permissible limits.

Through system study, one can determine the EHV network required for evacuation of power from generating station and strengthening lines to provide grid stability.



The loading pattern of consumer's viz. industrial, agricultural, domestic and commercial indicated by various DISCOMs and location of load point determine the requirement of 66 kV substations in the state.

The following standard practice has been considered, as per CEA Transmission Planning Criteria, for formulation of transmission plan-

3.5.1 CEA - Transmission system planning & design criteria:

Central Electricity Authority (CEA) has evolved transmission system planning & design criteria for the National Electricity Plan. The planning criteria as per CEA are:

- In normal operation ('N-0') of the grid, with all elements to be available in service in the time horizon of study, it is required that all the system parameters like voltages, loadings, frequency should remain within permissible normal limits.
- The grid may however be subjected to disturbances and it is required that after a more probable disturbance i.e. loss of an element ('N-1' or single contingency condition), all the system parameters like voltages, loadings, frequency shall be within permissible normal limits.
- The steady state voltage limit on 400 kV system is between 380 kV and 420 kV.
- The steady state voltage shall be maintained within the limits given below:

Voltage (kV - rms)		
Nominal	Maximum	Minimum
132	145	122
220	245	198
400	420	380
765	800	728

- The rated breaking current capability of switchgear i.e. fault level at different voltage levels shall be as below: (also mentioned in the Gujarat Electricity Grid Code regulations)

Voltage level	Rated Breaking capacity
132 kV	25/31.5 KA
220 kV	31.5/40 KA
400 kV	50/63 KA
765 kV	40/50 KA

- The capacity of any single substation at different voltage levels shall not normally exceed: (also mentioned in the Gujarat Electricity Grid Code regulations)

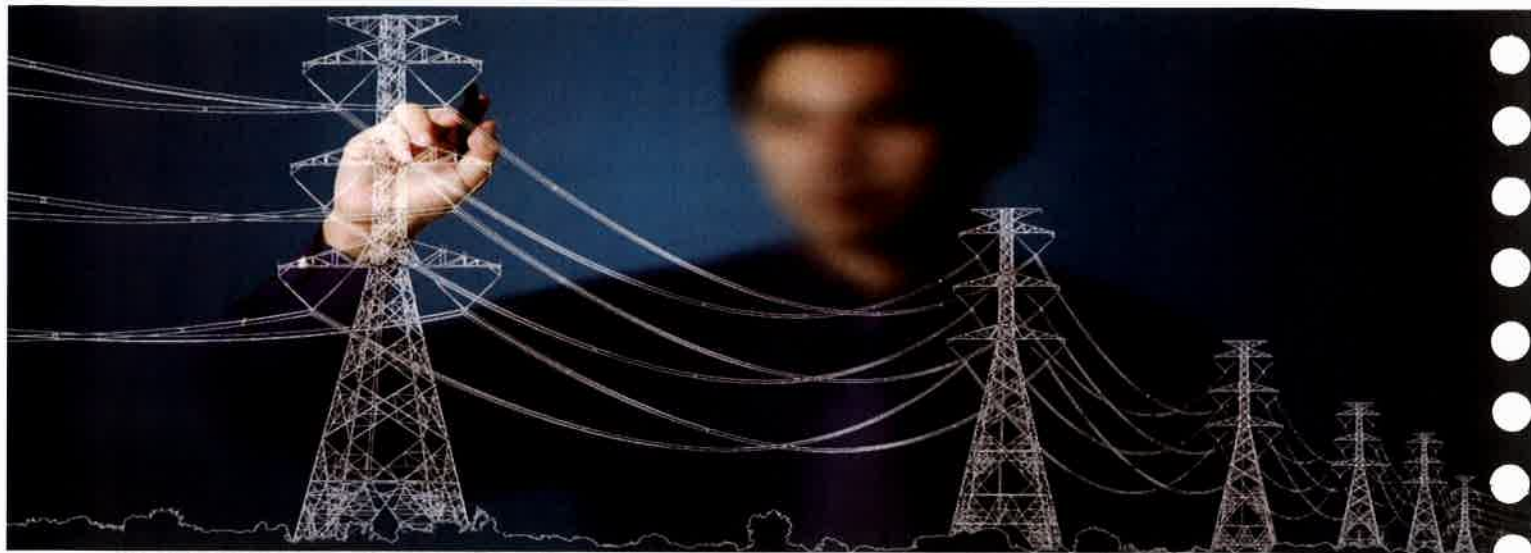
Voltage level	Substation Capacity
132 kV	250 MVA
220 kV	500 MVA
400 kV	2000 MVA
765 kV	9000 MVA



- With the operational study as initial conditions, prioritization study is carried out with the following assumptions
 - Generation evacuation schemes - High priority
 - Meeting the demand
 - Improving quality of power supply
 - Improving reliability satisfying grid code security requirements
 - While carrying out system study, ISTS network (existing and proposed) is also considered.

Considering all the above aspects, transmission lines and substations are proposed by GETCO (as subsequently chapter): Transmission Plan of GETCO network upto year - 2025:

* * * * *



4. Transmission Plan of GETCO Network for upto year – 2025 & onwards:

4.1 Substations Planned upto year - 2025 & onwards:

4.1.1 Year wise substations proposed upto year - 2025 and onwards:

Voltage Class	As on 31.03.2021	Year					Total
		2021-22	2022-23	2023-24	2024-25	2025 Onwards	
400 kV	18	2	2	1	1	4	10
220 kV	112	3	10	5	7	17	42
132 kV	57	1	-	-	-	-	1
66 kV	1989*	91	88	94	92	90	455
Total	2176	97	100	100	100	111	508

Note: (*) one 33 kV substation included

4.1.2 Year wise Transformation Capacity to be added up to year 2025 & onwards:

Voltage Class	Year					Total
	2021-22	2022-23	2023-24	2024-25	2025 Onwards	
400 kV	2000	2000	1000	1000	6000	12000
220 kV	3290	3840	1920	2860	7960	19870
132 kV	200	-	-	-	-	200
66 kV	2730	2640	2820	2760	2700	13650
Total	8220	8480	5740	6620	16660	45720



Item	Quantity		Name of S/S
400 kV Substation	10 Nos.	10	New substation: Achhalia, Bhogat, Dholera, Kalavad, Keshod, Pipavav, Prantij, Saykha, Shapar, Shivilakha
		2	Substation charged: Bhachunda, Pachchham
220 kV Substation	42 Nos.	30	New substation: Avaniya, Babarzar, Bagasara, Balethi, Bhesan, Chikada, Dhama, Dumas, Ghiyavad, Gondal-II (Gomta), Halol, Kamlapur, Khajod, Khambhalia, Kheradi, Khodu, Limzar, Maglana, Mandali, Makansar, Nichimandal (Vankda), Olpad, Patkhilori, Raghanesda, Rah, Rajula, Sarvala, Sevalia, Sistrana (Satlasana), Veraval
		2	Substation charged: Babara, Talaja,
		12	Upgradation from existing 66 kV/132 kV to 220 kV level- 66 kV: Bhat, Kanbha, Mahuva, Sarigam, Siddheshwar, Velanja, Metoda, Mera, Bhildi, Gandhidham-B (or Padana) 132 kV : Ankleshwar, Chiloda,
132 kV Substation	1 No.	1	New substation: 132 kV Supedi

4.2 Transmission schemes planned during FY 2020 - 2025 & onwards:

4.2.1 400 kV Transmission schemes:

Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
[A] 2021-22				
1	400 kV Fedra/ Pachchham (A'bad) (Substation Charged)	1. LILO of proposed 400 kV D/C Kasor-Amreli line at Fedra 2. LILO of one circuit of 400 kV D/C Kosamba - Chorania line at Fedra (Commissioned) 3. LILO of 220 kV S/C Kasor-Dhuvaran-Vartej line at Fedra (Commissioned) 4. LILO of 220 kV S/C Kasor-Dhuvaran-Botad line at Fedra (Commissioned) 5. 400/220 kV, 2 X 500 MVA ICTs 6. 220/66 kV, 2 X 160 MVA ICTs	80 46 20 20	System Strengthening



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2	400 kV Shapar (Rajkot)	400 kV D/C Hadala-Shapar line (AL-59) 400 kV D/C Fedra-Shapar line - LILO of 220 kV S/C Chorania-Sarla and Sarla-Gondal lines (due to LILO of 220 kV S/C Chorania-Gondal line at Sarla substation) at Shapar substation 400/220 kV, 2 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	130 200 60	System Strengthening
[B] 2022-23				
3	400 kV Bhogat (Jamnagar)	400 kV D/C Bhogat - Kalavad line 220 kV D/C Bhogat - Bhatia line (Commissioned) 220 kV D/C Bhogat - Ranavav line 400/220 kV, 3 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	240 26 140	RE Integration
4	400 kV Bhachunda (Kutch) (Substation Charged)	400 kV D/C Bhachunda-Varsana line 400/220 kV, 2 X 500 MVA ICTs	276	RE Integration
[C] 2023-24				
5	400 kV Kalavad (Rajkot)	- LILO of 400 kV D/C Essar-Hadala line at Kalavad substation (Commissioned) 220 kV D/C Bhatia - Kalavad line 220 kV D/C Kalavad - Kangasiyali line 400/220 kV, 2 X 500 MVA ICTs 220/66, 2 X 160 MVA ICTs	16 238 112	RE Integration
[D] 2024-25				
6	400 kV Prantij (Sabarkantha)	400 kV D/C Prantij - Sankhari line - LILO of one ckt of proposed 400 kV D/C Wanakbori - Soja line at Prantij substation 220 kV Prantij - Agiyol line 220 kV Prantij - Dhansura line 400/220 kV, 2 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	100 40 60 70	System Strengthening
[E] 2025-26 & Onwards				
7	400 kV Achhalia (Bharuch)	400 kV D/C Kosamba - Achchhalia line - LILO of 400 kV S/C SSP - Asoj line at Achhalia - LILO of 400 kV S/C SSP - Kasor at Achhalia - LILO of 220 kV D/C Ukai (T) - Achhalia line at 400 kV Achhalia - Termination of 220 kV D/C GPEG - Haladarava line at Achhalia 220 kV D/C Suva - Achhalia line 400/220 kV, 2 X 500 MVA ICTs	140 40 40 20 90 140	System Strengthening



Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
8	400 kV Pipavav (Amreli)	400 kV D/C Pipavav-Amreli line 220 kV D/C Pipavav - Otha line 220 kV D/C Pipavav-Bagasara line 220 kV D/C Pipavav - Rajula line 400/220 kV, 2 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	150 50 80 12	System Strengthening
9	400 kV Saykha (Bharuch)	- LILO of 400 kV S/C Kosamba - Pachham line at 400 kV Saykha - LILO of 400 kV S/C Kosamba - Charal line at 400 kV Saykha - LILO of 220 kV S/C Haldarwa - Dahej line and 220 kV S/C Wagra - Dahej line at 400 kV Saykha (Both circuit on M/C tower) 220 kV D/C Saykha - Suva on M/C tower 400/220 kV, 3 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	2 2 1 5	System Strengthening
10	400 kV Keshod (Junagadh)	400 kV D/C Kalavad - Keshod - LILO of both circuit of 220 kV D/C Visavadar - Timbadi line at 400 kV Keshod substation 220 kV D/C Keshod (400 kV) - Keshod line 220 kV D/C Keshod (400 kV) - Veraval line 400/220 kV, 2 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	220 24 46 90	RE Integration
11	400 kV Shivilakha (Kutch)	400 kV D/C Bhachunda - Shivilakha line (Twin AL-59) 400 kV D/C Shivilakha - Veloda (Sankhari) line (Twin AL-59) - LILO of both circuit of 220 kV D/C Tappar - Shivilakha line at Shivilakha (400 kV) substation (M/C tower AL-59) 400/220 kV, 2 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICTs	210 245 25	RE Integration
12	400 kV Dholera (Ahmedabad)	- LILO of 400 kV D/C Fedra - Dholera-'AA' line at Dholera Solar Park substation i.e. extension of 400 kV D/C Fedra - Dholera-'AA' line upto Dholera Solar Substation 400/220 kV, 3 X 500 MVA ICTs 220/66 kV, 2 X 160 MVA ICT	15	RE Integration



4.2.2 220 kV Transmission schemes:

Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
[A] 2021-22				
1	220 kV Rajula (Amreli)	1. LILO of one circuit of 220 kV D/C GPPC - Dhokadava line at 220 kV Rajula substation 2. 220/66 kV, 2 X 160 MVA ICTs	10	System Strengthening
2	220 kV Raghnesda (Banaskantha)	1. 220 kV Raghnesda - Vav (Khimnavas) line 2. 220/33 kV, 6X125 MVA ICTs	35	RE Integration
3	220 kV Babra (Amreli) (Substation Charged)	1. 220 kV D/C Amreli (400 kV) - Babra line 2. 220 kV D/C Babara - Gondal - II line 3. 220 kV D/C Babara - Shapar line 4. LILO of both circuits of 132 kV D/C Theoliya Wind farm - Jasdan line at 220 kV Babara substation on M/C Tower 5. 220/66 kV, 2 X 160 MVA ICTs 6. 220/132 kV, 2 X 150 MVA ICTs	52 80 140 25	RE Integration
4	220 kV Talaja (Amreli) (Substation Charged)	1. LILO of both the circuits of 220 kV Otha - Sagapara line at 220 kV Talaja s/s 2. 220/66 kV, 2 X 160 MVA ICTs	30	RE Integration
5	220 kV Khambhalia (Jamnagar)	1. LILO of both circuits of 220 kV D/C Bhatia-Kalavad-Kangasiyali line at Khambhalia substation 2. 220/66 kV, 2 X 160 MVA ICTs	40	RE Integration
[B] 2022-23				
6	Up-gradation of 66 kV Mera to 220 kV (AIS) (Banaskantha)	1. LILO of one circuit of 220 kV D/C Tharad-Deodar at 220 kV Mera substation 2. 220 kV D/C Mera - Agathala line 3. 220/66 kV, 2 X 160 MVA ICTs	10 70	System Strengthening (KSY)
7	Up-gradation of 66 kV Bhildi to 220 kV (GIS) (Patan)	1. LILO of both Circuit of 220 kV D/C Kansari (Zerda) - Deodar line at 220 kV Bhildi 2. 220/66 kV, 2 X 160 MVA ICTs	2X40	System Strengthening (KSY)
8	220 kV Rah (Banaskantha)	1. LILO of both circuit of 220 kV D/C Tharad-Dhanera at 220 kV Rah substation 2. 220/66 kV, 2 x 160 MVA ICTs	20	System Strengthening (KSY)
9	220 kV Padana / upgradation of 66 kV Gandhidham (Kutch)	1. LILO of 220 kV S/C Anjar - Welspun line 2. LILO of 220 kV S/C Shivilakha - Welspun line or 1. LILO of 220 kV S/C Bhimasar - Morbi line 2. LILO of 220 kV S/C Bhimasar - Sartanpar line 3. 220/66 kV, 2 X 160 MVA ICTs	2X16	System Strengthening (KSY)



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Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
10	220 kV Sisrana (Banaskantha)	1. LILO of both circuit of 220 kV D/C Palanpur - Kheralu line at 220 kV Sisrana/Satlasana substation 2. 220/66 kV, 2X160 MVA ICTs	12	System Strengthening (KSY)
11	220 kV Bhesan (Junagadh)	1. LILO of 220 kV S/C Jetpur - Visavadar line at 220 kV Bhesan substation 2. 220 kV S/C Jetpur - Bhesan line 3. 220 kV D/C Bhesan - Patkhilori line 4. 220/66 kV, 2X160 MVA ICTs	8 30 35	System Strengthening (KSY)
12	220 kV Patkhilori (Rajkot)	5. LILO of one circuit of 220 kV Amreli - Babara line at 220 kV Patkhilori substation 6. 220 kV D/C Patkhilori - Gomta line 7. 220/66 kV, 2X160 MVA ICTs	40 50	System Strengthening (KSY)
13	220 kV Khodu (Surendranagar)	1. 220/66 kV, 2X160 MVA ICTs		System Strengthening (KSY)
14	220 kV Babarzar (Jamnagar)	1. LILO of both circuits of 220 kV D/C Moti Gop - Kalavad line at 220 kV Babarzar substation 2. 220/66 kV, 2X160 MVA ICTs	15	System Strengthening (KSY)
15	220 kV Ghiyavad (Morbi)	1. LILO of one circuit of 220 kV D/C Halvad - Sartanpar line at 220 kV Ghiyavad 2. 220 kV D/C Shapar (400 kV) - Ghiyavad 3. 220/66 kV, 2 X 160 MVA ICTs	10 50	System Strengthening (KSY)
[C] 2023-24				
16	220 kV Maglana (Bhavnagar)	1. 220 kV D/C Amreli (400 kV) - Maglana line 2. LILO of 220 kV S/C Vallabhipur - Vartej line at 220 kV Maglana substation with OPGW (Commissioned) 3. 220/66 kV, 2 X 160 MVA ICTs	200 10	System Strengthening
17	Up-gradation of 66 kV Metoda to 220 kV (GIS) (Rajkot)	1. LILO of 220 kV S/C Jetpur-Rajkot line at Metoda substation (3.2 U/g cable + 1 Overhead line) 2. 220/66 kV, 2 X 160 MVA ICTs	4.2	System Strengthening
18	220 kV Khajod (GIS) (Surat)	1. LILO of both the circuits of 220 kV D/C Kawas - Navsari (PG) line at 220 kV Khajod 2. 220/66 kV, 2 X 160 MVA ICTs	10	System Strengthening
19	220 kV Sevalia (Kheda)	1. LILO of one circuit of 220 kV D/C Wanakbori - Asoj line at 220 kV Sevalia substation (Commissioned) 2. 220/66 kV, 2 X 600 MVA ICTs	40	System Strengthening
20	220 kV Kamlapur (Rajkot)	1. LILO of both circuit of 220 kV D/C Shapar - Babara line at 220 kV Kamlapur 2. 220 kV D/C Kamlapur - Gondal II line 3. 220/66 kV, 2 X 160 MVA ICTs	15 60	RE Integration



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Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
[D] 2024-25				
21	220 kV Olpad (GIS) (Surat)	1. LILO of both circuits of 220 kV D/C GSEG - Kosamba line at 220 kV Olpad substation with pile foundation 2. 220/66 kV, 2 X 160 MVA ICTs	34.90	System Strengthening
22	Up-gradation of 132 kV Chiloda to 220 kV level (GIS) (G'nagar)	1. LILO of both circuits of 220 kV D/C Gandhinagar TPS- Soja line at Chiloda substation 2. 220/132 kV, 2 X 150 ICTs 3. 220/66 kV, 2 x 160 MVA ICTs	60	System Strengthening
23	220 kV substation near Gondal (Rajkot)	1. 220 kV D/C Kamlapur - Gondal II line 2. 220/66 kV, 2 X 160 MVA ICTs	30	System Strengthening
24	220 kV Halol (GIS) (Panchmahal)	1. LILO of one circuit of 220 kV D/C Chandrapura - Godhara line at 220 kV Halol substation 2. LILO of one circuit of 220 kV D/C Vadodara - Vyankatpura line at Halol 3. 220/66 kV, 2 X 160 MVA ICTs	10 50	System Strengthening
25	220 kV Veraval (GIS) (Junagadh)	1. LILO of 220 kV S/C Keshod - Timbdi line at 220 kV Veraval substation 2. 220/66 kV, 2 X 160 MVA ICTs	16	System Strengthening
26	220 kV Siddheshwar (GIS) (Rajkot)	1. LILO of both circuit of 220 kV D/C Kalavad - Kangashiyali line at 220 kV Siddheshwar substation 2. 220/66 kV, 3X160 MVA ICTs	5.5	System Strengthening
27	Upgradation of 66 kV Sarigam to 220 kV (GIS) (Valsad)	1. 220 kV D/C Bhilad - Sarigam line 2. LILO of 220 kV S/C Tarapur - Vapi line at Sarigam 3. 220/66 kV, 2 X 160 MVA ICTs	15	System Strengthening
[E] 2025-26 & Onwards				
28	Up-gradation of 66 kV Velanja 220 kV (GIS) (Surat)	1. LILO of 220 kV S/C GSEG - Kim line at Velanja 2. LILO of 220 kV S/C GSEG - Mora - Kim line at Velanja 3. 220/66 kV, 2 X 160 MVA ICTs	10	System Strengthening
29	220 kV Bagasara (Amreli)	1. LILO of 220 kV S/C Savarkundla-Visavadar line at Bagasara substation 2. 220/66 kV, 2 X 160 MVA ICTs	10	System Strengthening
30	220 kV Avaniya (Bhavnagar)	1. LILO of both circuit of 220 kV D/C BECL - Botad line 2. 220/66 kV, 2 X 160 MVA ICTs	2X30	System Strengthening



Gujarat Energy Transmission Corporation Limited

Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
31	Up-gradation of 66 kV Kanbha to 220 kV (GIS) (A'bad)	1. LILO of one circuit of 220 kV D/C Ranasan - Kanbha line at 220 kV Kanbha substation 2. 220 kV D/C Dehgam - Kanbha line 3. 220/66 kV, 2 X 160 MVA ICTs	0.5 5	System Strengthening
32	220 kV Chikda (Surat)	4. LILO of both circuit of 220 kV D/C Ukai(Hy) - Achhalia line at 220 kV Chikda 5. 220/66 kV, 2 X 160 MVA ICTs	120	System Strengthening
33	Up-gradation of 66 kV Bhat to 220 kV (GIS) (Gandhinagar)	1. LILO of both circuits of 220 kV D/C Gandhinagar TPS- Ranasan line at Bhat substation. 2. 132 kV 800 sq. mm (6+1) U/G cable from Bhat to Chandkheda. 3. 220/132 kV, 2 X 150 MVA ICTs 4. 220/66 kV, 2 X 160 MVA ICTs	32 10	System Strengthening
34	220 kV Sarvala (Tapi)	1. LILO of one circuit of 220 kV D/C Ukai (Hydro) - Chikda line at 220 kV Sarvala substation 2. 220/66 kV, 2 X 160 MVA ICTs	2X70	System Strengthening
35	220 kV Kheradi (Arvali)	1. LILO of one circuit of 220 kV Bhutiya - Agiyol at 220 kV Kheradi 2. LILO of one circuit of 220 kV Agiyol - Dhansura at 220 kV Kheradi 3. 220/66 kV, 2 X 160 MVA ICTs	20 28	System Strengthening
36	220 kV Makansar (Hybrid) (Rajkot)	1. LILO of 220 kV S/C Sartanpar - Wankaner line at 220 kV Makansar substation 2. LILO of 220 kV S/C Morbi - Hadala line at 220 kV Makansar substation 3. 220/66 kV, 2 X 160 MVA ICTs	2 20	System Strengthening
37	220 kV Mandali (Mehsana)	1. LILO of 220 kV S/C Mitha - Soja line at 220 kV Mandali 2. 220 kV D/C Chharodi (400 kV) - Mandali line 3. 220/66 kV, 2 X 160 MVA ICTs	30 120	System Strengthening
38	220 kV Limzar (Navsari)	1. LILO of both circuits of 220 kV D/C Navsari - Nasik line at 220 kV Limzar substation 2. 220/66 kV, 2 X 160 MVA ICTs	30	System Strengthening
39	Upgradation of 66 kV Mahuva to 220 kV (GIS) (Surat)	1. LILO of both circuits of 220 kV D/C Mota - Chikhli (Ambheta) line at 220 kV Mahuva substation 2. 220/66 kV, 2 x 160 MVA ICTs	10	System Strengthening



Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
40	Up-gradation of 132 kV Ankleshwar to 220 kV (GIS) (Bharuch)	1. LILO of both circuits of 220 kV D/C Kawas TPS - Haldarwa line at Ankleshwar substation 2. LILO of one circuit of 132 kV D/C Achhalia - Ankleshwar line at Valia substation 3. 220/66 kV, 2 x 160 MVA ICTs 4. 220/132 kV, 2 X 150 MVA ICTs	10 15	System Strengthening
41	220 kV Dumas (GIS) (Surat)	1. LILO of S/C Ichchhapore - Sachin line at 220 kV Dumas 2. LILO of S/C GSEG - Sachin line at 220 kV Dumas 3. 220/66 kV, 2 x 160 MVA ICTs	5 5	System Strengthening
42	220 kV Balethi (Surat)	1. LILO of one circuit of 220 kV D/C Ukai(TH) - Acchalia line at 220 kV Balethi 2. 220 kV D/C Kosamba - Balethi line 3. 220/66 kV, 2 x 160 MVA ICTs	15 35	System Strengthening
43	220 kV Nichimandal (Vankda) (Morbi)	1. LILO of both circuit of 220 kV Charadva - Bhimasar at 220 kV Shapar 2. 220/66 kV, 2 X 160 MVA ICTs	10	RE Integration
44	220 kV Dhama (S'nagar)	1. 220 kV D/C Mansar (Halvad) - Dhama line (AL-59) 2. 220 kV D/C Dhama - Bechraji line (AL-59) 3. 220 kV D/C Dhama - Chharodi line (AL-59) 4. 220/66 kV, 2 X 160 MVA ICTs	220 90 200	RE Integration

4.2.3 132 kV Transmission schemes:

Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)	Type of Scheme
2021-22				
1	132 kV Supedi	1. LILO of one circuit of 132 kV S/C Gondal - Bhayavadar line 2. 132/66 kV, 2 X 100 MVA ICTs	1.5	System Strengthening (KSY)

**4.3 Other system strengthening lines planned up to year 2025 & onwards:****4.3.1 400 kV Transmission lines:**

Sr. No.	Name of Transmission lines	Line Length (CKm)
1	400 kV D/C Vadavi-Halvad line	290
2	LILO of 400 kV S/C Adani-Hadala line at Halvad	90
3	400 kV D/C Amreli - Kasor line	470
4	400 kV D/C Varsana - Halvad line	238
5	400 kV D/C Soja-Zerda (Kansari) (AL-59)	268
6	LILO of one circuit of 400 kV D/C Halvad -Vadavi line at Chharodi	60

4.3.2 220 kV Transmission lines:

Sr. No.	Name of Transmission lines	Line Length (CKm)
1	220 kV D/C Pirana (PG) - Barejadi line	50
2	220 kV D/C Wanakbori TPS-Zalod along with one circuit LILO at 220 kV Saudasana Muvada.	170
3	220 kV D/C Virpore - Chikhli line	120
4	LILO of one circuit of 220 kV D/C Amreli - Dhasa line at 220 kV Gariyadhar substation	80
5	LILO of 220 kV S/C Lalpar - Sartanpar line at 220 kV Wankaner substation	28
6	220 kV D/C Gavasad - Salejada line	194
7	220 kV D/C Chorania - Botad line	103
8	LILO of one circuit of 220 kV D/C Bhachau - Radhanpur line at 400 kV Charanka substation	10
9	220 kV D/C Padva (BECL) - Botad	190
10	LILO of one circuit of 220 kV D/C Kasor - Gavasad line at 220 kV Gotri substation along with conversion of 132 kV D/C Gotri - Dhuvaran - Karamsad line in 220 kV M/C tower line up to LILO point of 220 kV Kasor - Gavasad line	44
11	220 kV D/C Vapi-II (ISTS) - Atul line	50
12	LILO of 220 kV Chikhli (Ambheta) - Vapi(GETCO) line at 400 kV Vapi-II (ISTS)	40
13	LILO of 2 nd circuit of 220 kV D/C Jetpur - Sardargadh at 220 kV Shapur s/s	6.2
14	220 kV D/C Bhogat (400 kV) - Moti Gop line	140

4.3.3 132 kV Transmission lines:

Sr. No.	Name of Transmission Line	Line Length (CKm)
1	LILO of 132 kV S/C Gondal -Haripur line at 220 kV Visavadar	38



2	LILO of both circuits of 132 kV D/C Shikarpur W/F- Samakhiali line at Vondh substation	40
3	LILO of one circuit of 132 kV D/C Mehsana - Patan line at Sankhari substation	30
4	132 kV S/C Sankhari (400 kV) - Deesa line	20

4.3.4 Conductor strengthening of existing lines upto year 2025 & onwards:

Sr. No.	Name of Transmission Line	Line Length (CKm)
1	220 kV S/C Asoj - Jambuva line	49
2	220 kV S/C Vav - Sachin line	38.5
3	220 kV S/C Morbi - Lalpar line	7.3
4	220 kV S/C Jetpur - Gondal line	26
5	220 kV S/C Vadavi - Chhatral line	2
6	220 kV D/C Tappar - Shivilakha line	112
7	220 kV S/C Shivilakha - Sankhari line	185
8	220 kV S/C Shivilakha - Nani Hamitpur - Deodar line	190
9	220 kV D/C Dehgam - Khanpur line	23.5
10	132 kV S/C Karamsad - Nadiad line	27.2
11	132 kV S/C Nyara - Vikram line	33
12	132 kV S/C Nyara - Vajdi - Vikram line	33
13	132 kV S/C Gondal - Vikram line	39
14	132 kV S/C Gondal - Jasdan line	50
15	132 kV D/C Ranasan - Sabarmati line	26.2
16	132 kV D/C Ranasan - Vatwa line	53.2
17	132 kV S/C Sikka - Naghedi line	30

4.4 Reactive Power Compensation planned upto 2025 & onwards:

4.4.1 Proposed Reactors at 400 kV level:

Sr. No.	Name of Substation	Bus Reactor	Line Reactor
1	Wanakbori TPS	125 MVAR	-
2	Ukai TPS	125 MVAR	-
3	400 kV Kalavad	125 MVAR	-
4	400 kV Keshod	125 MVAR	-
5	400 kV Sankhari	125 MVAR	-
6	400 kV Bhogat	125 MVAR	-
7	400 kV Pipavav	125 MVAR	-
8	400 kV Achhalia	125 MVAR	-
9	400 kV Prantij	125 MVAR	-



10	400 kV Shapar	125 MVAR	-
11	400 kV Soja	125 MVAR	-
12	400 kV Saykha	125 MVAR	-
13	400 kV Dholera	125 MVAR	-
Total...		1625 MVAR	-

4.4.2 Shunt Compensation to be added by 2025:

4.4.2.1 Proposed Reactors at 220 kV level:

Sr. No.	Name of Station	District
220 kV, 1 X 25 MVAR switchable Bus Reactor		
2	220 kV Sagapara	Bhavnagar
3	220 kV Kangasiyali	Rajkot
4	220 kV Vartej	Bhavnagar

4.4.2.2 11 kV Capacitor bank

Sr. No.	Name of Station	Capacity
1	20 MVAR, 10 MVAR, 7.5 MVAR, 5 MVAR & 2.5 MVAR Capacitor Bank at existing 66 kV substations	1132.5 MVAR



5. Green Energy Corridor

5.1 About Green Energy Corridor

The Green Energy Corridor Project aims at synchronizing electricity produced from renewable sources, such as solar and wind, with conventional power stations in the grid.

For evacuation of large-scale renewable energy, Intra-State Transmission System (InSTS) project was sanctioned by the Ministry in 2015-16. It is being implemented by eight renewable-rich states of Tamil Nadu, Rajasthan, Karnataka, Andhra Pradesh, Maharashtra, **Gujarat**, Himachal Pradesh, and Madhya Pradesh. The project is being implemented in these states by the respective State Transmission Utilities (STUs).

The purpose is to evacuate 20,000 MW of large-scale renewable power and improvement of the grid in the implementing states. The total project cost is Rs. 10141 crores. The funding mechanism consists of 40% Government of India Grant (total Rs. 4056.67 crores), 20% state equity and 40% loan from KfW, Germany (500 million EUR).

As far as State of Gujarat is concerned, the project includes approximately 1888 CKm transmission lines and substations of a total capacity of 7980 MVA.

Status of Green Energy Corridor as on 31.03.2021:

Inter - State Transmission System		
Lines Planned	Length (CKm)	Status
765 kV D/C Banaskantha - Chittorgarh	604	Completed
765 kV D/C Banaskantha - Bhujpool	578	Completed
400 kV D/C Banaskantha - Sankhari	43	Completed

Intra -State Transmission System			
Lines Target (Nos / CKm)	Line constructed (Nos. / CKm)	Substations Planned (Nos. / MVA)	Substations Commissioned (Nos. / MVA)
18 / 1888	7 / 351	8 / 7980	5 / 2700



5.2 Intrastate transmission schemes under Green Energy Corridor-I:

GETCO identified and proposed the list of lines and substations costing Rs 1962.12 Crores for Renewable Energy evacuation and all such elements were accepted by the CEA, who was nodal agency while preparing Green Corridor Report in association with MNRE. GETCO Board have already accorded approval for implementation of various Intra-State transmission schemes under Green Energy Corridors.

(A) Substations:

Sr. No.	Name of Element	Quantum	Status
1	220 kV Babara substation (Dist. Amreli)		
	(1) 220/132 kV, 2 X 150 MVA,	2 x 150 MVA	Substation Charged
	(2) 220/66 kV, 2 X 160 MVA,	+	
	(3) 6 Nos. 220 kV, 4 Nos. of 132 kV & 6 Nos. 66 kV feeder bays.	2 x 160 MVA	
2	220 kV Bhachunda GIS substation (Dis. Kutch)		
	(1) 220/66 kV, 2 X 160 MVA	2 x 160 MVA	Substation Commissioned
	(2) 6 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays		
3	220 kV Kalavad GIS substation (Dis. Jamnagar)		
	(1) 220/66 kV, 3 X 160 MVA	3 x 160 MVA	Work in Progress
	(2) 10 Nos. of 220 kV & 10 Nos. of 66 kV feeder bays		
4	220 kV Moti Gop substation (Dist. Jamnagar)		
	(1) 220/66 kV, 3 X 160 MVA	3 x 160 MVA	Substation Commissioned
	(2) 8 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays		
5	Up-gradation of 132 kV Wankaner to 220 kV level (Dist. Rajkot) - GIS technology	3 x 160 MVA	
	(1) 220/66 kV, 3 X 160 MVA, 220/132 kV 2X150 MVA	+	Substation Commissioned
	(2) 4 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays	2 x 150 MVA	
6	400 kV Bhachunda GIS substation (Dist. Kutch)		
	(1) 400/220 kV, 2 X 500 MVA	2 x 500 MVA	Substation Commissioned with one 400/220 kV 500 MVA ICT
	(2) 4 Nos. of 400 kV feeder bays		
	(3) 400 kV, 1 x 125 MVAR Reactor with bay		
7	400/220/66 kV Bhogat GIS substation (Dist. Jamnagar)		
	(1) 400/220 kV, 2 X 500 MVA	2 x 500 MVA	Work in Progress
	(2) 220/66 kV, 2 X 160 MVA	+	
	(3) 2 Nos. of 400 kV feeder bays	2 x 160 MVA	
	(4) 400 kV, 1 x 125 MVAR Reactor with bay		
	(5) 6 Nos. of 220 kV & 6 Nos. of 66 kV bays		
8	400 kV Shapar GIS substation (Dist. Surendranagar)		
	(1) 400/220 kV, 3 X 500 MVA Trf with Bay	3 x 500 MVA	Work in Progress
	(2) 220/66 kV 3 X 160 MVA Trf with bay	+	
	(3) 400 kV, 1 x 125 MVAR Reactor with bay	3 x 160 MVA	



(B) Transmission Lines:

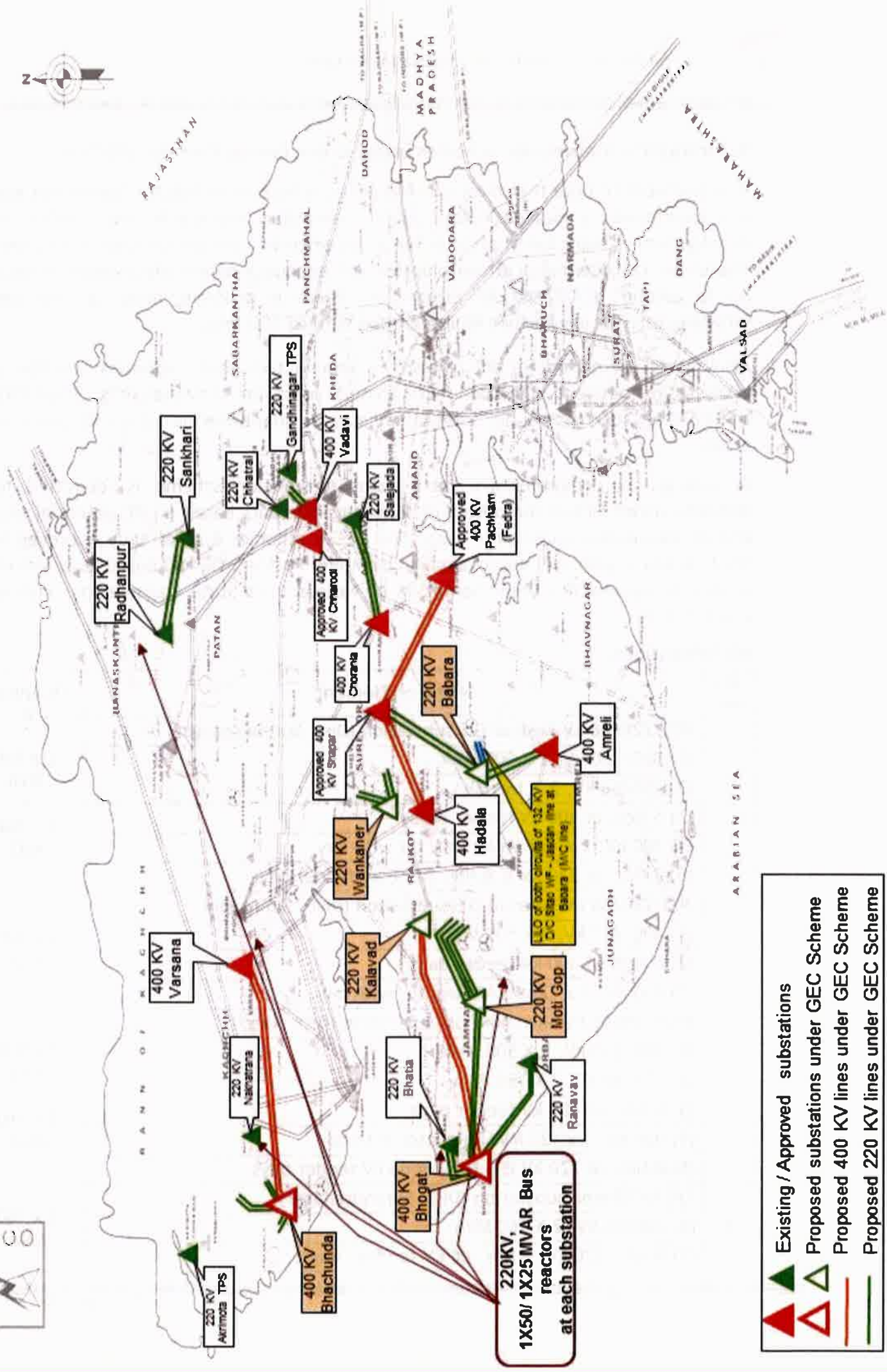
Sr. No	Name of Element	Quantum (RKM)	Status
1	400 kV D/C Bhogat - Kalavad line (Twin AL-59)	135	Work in Progress
2	400 kV Hadala - Shapar line (Twin AL-59)	65	Work in Progress
3	400 kV D/C Shapar - Pachham (Fedra) line (Twin AL-59)	100	Work in Progress
4	220 kV D/C Amreli-Babara line (AL-59)	25	Work in Progress
5	220 kV D/C Shapar-Babara line (AL-59)	60	Work in Progress
6	LILO of both circuits of 220 kV D/C Jamanvada - Varsana line at 220 kV Bhachunda (AL-59) M/C line	20	Commissioned
7	LILO of one circuit of 220 kV D/C Akrimota - Nakhatrana line at Bhachunda	32	Commissioned
8	220 kV D/C Bhatia - Bhogat line (AL-59)	15	Commissioned
9	220 kV D/C Bhogat - Ranavav line (AL-59)	75	Work in Progress
10	LILO of one circuit of 220 kV D/C Gandhinagar TPS - Chhatral line at Vadavi (AL-59)	25	Commissioned
11	220 kV D/C Chorania - Salejada line (AL-59)	70	Work in Progress
12	220 kV D/C Radhanpur - Sankhari line (AL-59)	55	Commissioned
13	LILO of one Circuit of 220 kV D/C Hadala - Sartanpar at 220 kV Wankaner (AL-59)	10	Commissioned
14	LILO of 220 kV S/C Lalpar - Sartanpar line at 220 kV Wankaner (M/C tower by replacement of existing 132 kV towers) (AL-59)	20	Work in Progress
15	220 kV D/C Bhogat - Moti Gop line (AL-59)	70	Work in Progress
16	LILO of both circuits of 220 kV D/C Tebhda - Nyara line at Moti Gop substation (M/C line : AL-59)	15	Commissioned
17	400 kV D/C Bhachunda - Varsana line (Twin AL-59)	140	Work in Progress
18	LILO of both circuits of 132 kV D/C Sitac WF - Jasdan line at Babara (M/C line)	25	Work in Progress

(C) Reactive Power Compensation:

Sr. No.	Name of Element	Quantum
1	220 kV, 1 x 50 / 1 x 25 MVAR Bus Reactors each at 220 kV Moti Paneli, Bhatia, Nakhatrana, & Deodar substations - (commissioned) 220 kV Bhachau (Work in progress)	5 Nos.

(D) Line / Reactor Bays:

Sr. No.	Name of Element	Quantum
1	4 Nos. of 400 kV feeder bays at Shapar and 2 Nos. of 400 kV feeder bays each at Kalavad, Hadala, Pachham (Fedra) & Varsana substations	12 Nos.
2	220 kV feeder bays : 2 Nos. each at Amreli, Shapar, Bhatia, Ranavav, Vadavi, Chorania, Salejada, Radhanpur & Sankhari substations and 1 No. of 220 kV Reactor bay each at MotiPaneli, Bhatia, Nakhatrana, Bhachau and Deodar substations	23 Nos.





5.3 Intrastate transmission schemes under Green Energy Corridor (GEC)-II:

It is pertinent to note that most of wind power is located in Kutch / Saurashtra area and solar power is located North Gujarat, Saurashtra and Kutch area. Further, RE development is being taken place in the areas wherein local consumption is very less. Therefore, considering local consumption and adequacy of already planned network up to around 10000 MW RE integration, there is a strong need to plan new infrastructure for any further RE integration with GETCO grid.

Also, gestation period for RE projects is around two years, whereas creation of transmission network will take more than 5 years for commissioning. Therefore, transmission schemes for RE integration may be identified based on RE potential areas.

Accordingly, a comprehensive Intra-State transmission scheme is identified for inclusion under GEC-II comprising of following elements based on RE potential sites and RE evacuation constraints area. The GEC-II schemes area already approved by the CEA and in-principal approval given by MNRE. Further, GETCO Board have already accorded approval for implementation of various Intra-State transmission schemes under GEC-II.

(A) Substations:

Sr. No.	Name of Element	Quantum
1	400/220/66 kV Keshod GIS substation (Dist. Surendranagar)	2 x 500 MVA + 2 x 160 MVA
	(1) 400/220 kV, 2 X 500 MVA	
	(2) 220/66 kV, 2 X 160 MVA	
	(3) 6 Nos. of 400 kV feeder bays	
	(4) 400 kV, 1 x 125 MVAR Reactor with bay	
	(5) 8 Nos. of 220 kV & 8 Nos. of 66 kV feeder bays	
2	400/220/66 kV Kalavad GIS substation (Dist. Jamnagar)	2 x 500 MVA
	(1) 400/220 kV, 2 X 500 MVA	
	(2) 8 Nos. of 400 kV feeder bays	
	(3) 400 kV, 1 x 125 MVAR Reactor with bay	
3	400/220/66 kV Shivilakha GIS substation (Dist. Kutch)	2 x 500 MVA + 2 x 160 MVA
	(1) 400/220 kV, 2 X 500 MVA	
	(2) 220/66 kV, 2 X 160 MVA	
	(3) 6 Nos. of 400 kV feeder bays	
	(4) 400 kV, 1 x 125 MVAR Reactor with bay	
	(5) 8 Nos. of 220 kV & 8 Nos. of 66 kV feeder bays	
4	220 kV Dhama substation (Dist. Surendranagar)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 8 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	



Sr. No.	Name of Element	Quantum
5	220 kV Shapar (near Jetpar) substation (Dist. Morbi)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 6 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	
6	220 kV Khambhalia substation (Dist. Bhavnagar)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 6 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	
7	220 kV Kamlapur substation (Dist. Rajkot)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 8 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	
8	220 kV Talaja substation (Dist. Bhavnagar)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 6 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	
9	220 kV Ghiyavad substation (Dist. Morbi)	2 x 160 MVA
	(1) 220/66 kV, 2 X 160 MVA,	
	(2) 8 Nos. 220 kV, 6 Nos. 66 kV feeder bays.	

(B) Transmission Lines:

Sr. No.	Name of Element	Quantum (RKM)
1	400 kV D/C Kalavad - Keshod line (Twin AL-59)	120
2	400 kV D/C Keshod - Shapar line (Twin AL-59)	190
3	400 kV D/C Shapar - Chharodi line (Twin AL-59)	90
4	400 kV D/C Bhachunda - Shivilakha line (Twin AL-59)	210
5	400 kV D/C Shivilakha - Veloda (Sankhari) line (Twin AL-59)	245
6	400 kV D/C Veloda (Sankhari) - Prantij line (Twin AL-59)	150
7	LILO of one circuit of 400 kV D/C Soja - Zerda line at Veloda (Sankhari) substation	50
8	LILO of both circuit of 220 kV D/C Visavadar - Timbdi at 400 kV Keshod substation	12
9	220 kV D/C (400 kV) Keshod - Keshod line	25
10	220 kV D/C Mansar (Halvad) - Dhama line (AL-59)	110
11	220 kV D/C Dhama - Bechraji line (AL-59)	45
12	220 kV D/C Dhama - Chharodi line (AL-59)	100
13	LILO of 220 kV S/C Bala (SSNNL) - Dhanki (SSNNL) at 220 kV Sarla (GETCO) substation (AL-59)	45
14	LILO of both circuits of 220 kV D/C Bhimasar - Charadava line at 220 kV Shapar substation (M/C tower AL-59)	10
15	220 kV D/C Shapar (near Jetpar) - Shapar (400 kV S/S) line (AL-59)	85
16	220 kV D/C Tappar - Radhanpur line (AL-59)	170

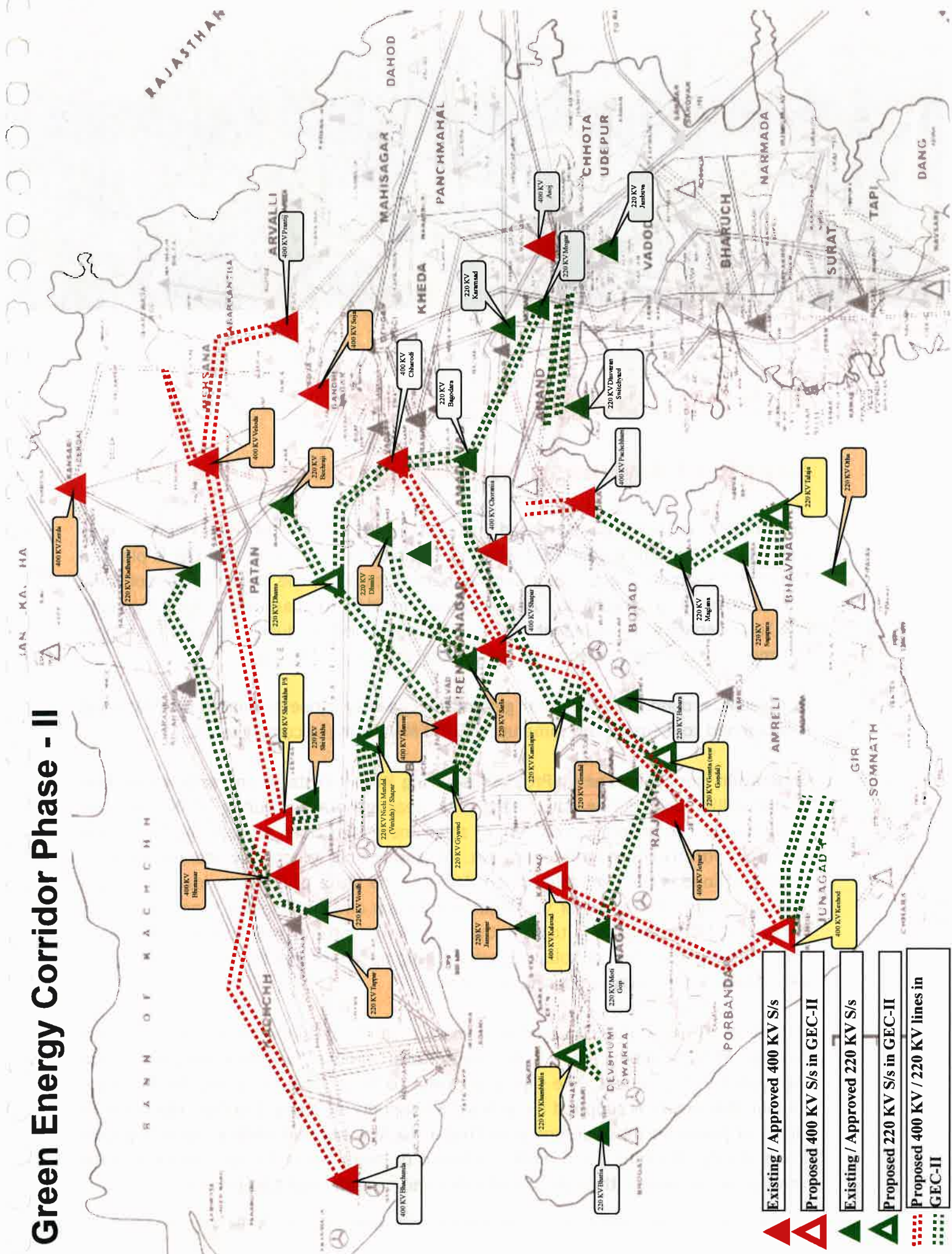


Sr. No.	Name of Element	Quantum (RKM)
17	LILO of both circuit of 220 kV D/C Tappar - Shivlakha line at Shivlakha (400 kV) substation (M/C tower AL-59)	25
18	LILO of both circuit of 220 kV D/C Bhatia - Kalavad line at Khambhalia substation (M/C tower AL-59)	20
19	LILO of both circuits of 220 kV D/C Shapar - Babara line at 220 kV Kamlapur substation (AL-59)	15
20	220 kV D/C Kamlapur - Bagodara line (AL-59)	110
21	220 kV D/C Moti Gop - Gondal-II (Gomta) line (AL-59)	125
22	220 kV D/C Ghiyavad - Shapar (400 kV s/s) line (AL-59)	50
23	LILO of one circuit of 220 kV D/C Hadala - Sartanpar line at 220 kV Ghiyavad substation (AL-59)	10
24	LILO of both circuit of 220 kV D/C Otha - Sagapara line at Talaja substation (M/C tower AL-59)	20
25	220 kV D/C Talaja - Maglana line (AL-59)	60
26	220 kV D/C Maglana - Pachchham line (AL-59)	100

(C) Reactive Power Compensation:

Sr. No.	Name of Element	Quantum
1	400 kV, 50 MVAR line Reactor for 400 kV D/C Bhachunda - Shivlakha & Shivlakha - Veloda lines : 50 MVAR line reactor for each circuits at both the ends	8 Nos.

AN K. A. HA





6. Kisan Suryoday Yojana -

Supply of daytime power to agricultural sector

Government of India has targeted installation of 175 GW of Renewable Energy Capacity by the end of year 2022 wherein capacity to the tune of 100 GW is planned from Solar sources. The State of Gujarat being located at the western coast of India is blessed with geographically advantageous position for harnessing Wind Capacity and Solar capacity. Government of Gujarat has notified conducive policies from time to time to encourage setting up of Renewable capacity in the State.

At present, around 3266 MW Solar generation capacity is operational in the State and it is planned to increase the same upto 10750 MW during upcoming years.

Generation from Solar Energy Projects is having Must Run status and solar generation is availability only during day period with peak generation during 11:00 Hours to 15:00 Hours. The generation pattern of solar energy has been a challenge for system operators for balanced grid operation. In absence of electricity storage facility, shifting of load is the available option. Since in the State of Gujarat, load shifting in other than Agricultural sector viz. Industrial, Urban and Rural sector is not practiced, the only option available is to shift the load of Agricultural sector. It is anticipated that with augmentation of solar capacity during upcoming period, the availability of solar power would increase during day period.

At present, Gujarat State is catering to more than 17.25 Lakh Agricultural consumers through 8100 Numbers of 11 kV Agricultural feeders wherein consumers are segregated in 153 Groups. The supply of power to these groups is scheduled in such a manner that power is supplied for at least 8 hours during a day. Further, the hours of supply of power to these groups is rotated in such a way that each group is supplied power during day time for a week, followed by night hours for next week and for subsequent two weeks through partially day and partially night hours supply.



The farmers face hardships as well as risk related to insects and animals for agricultural activity when power supply is supplied during night hours. Various Group of Farmers and Associations have been representing for supply for power during day period since long. In case supply hours of agricultural power is shifted from night period to day period, it will help in power purchase cost optimization and balanced grid operation by enabling consumption of solar generation in the grid and simultaneously would help in improving agricultural productivity by addressing grievance of farmers for hardships faced by them towards night power supply.

In the above background, Government of Gujarat has adopted an innovative approach through announcement of “Kisan Suryoday Yojana” for the benefit of all stakeholders. Government of Gujarat launched Kisan Suryoday Yojana during Budget session for financial year 2020-21.

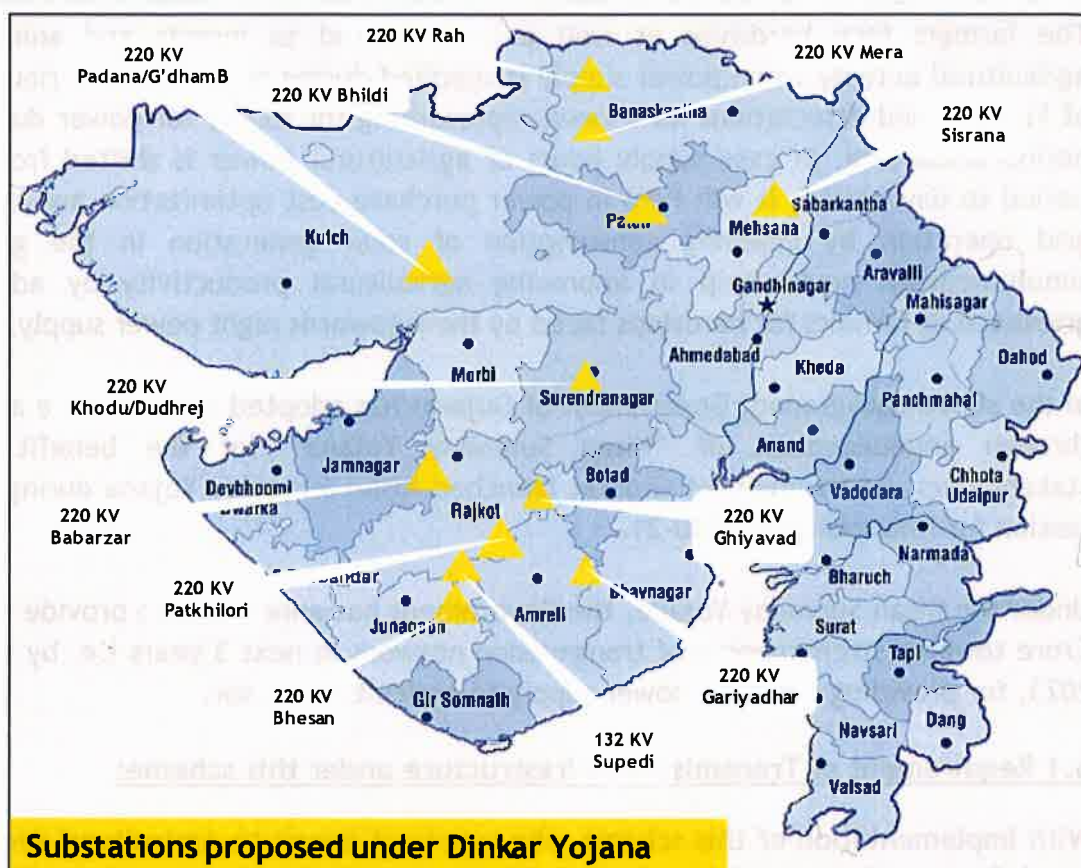
Under the Kisan Suryoday Yojana, the Government has announced to provide Rs. 3500 Crore towards strengthening of transmission network in next 3 years i.e. by the year 2023, for providing day time power supply to agriculture sector.

6.1 Requirement of Transmission Infrastructure under this scheme:

With implementation of this scheme, the supply of power to Agricultural sector will be shifted to day period i.e. from 5:00 AM to 9:00 PM during a day, which will increase the Agriculture load to around 11000 to 13000 MW as against 6000 MW to 6500 MW at present.

Also, considering huge addition in anticipated demand at few 220 kV / 132 kV substations and space constraints for line bay requirement for identified 66 kV strengthening lines, following 12 Nos. of EHV substations along with associated 220 kV & 66 kV lines are proposed under Kisan Suryoday Yojana -

- 220 kV Satlasana/Sisrana Dist. Mehsana
- Upgradation of 66 kV Bhildi to 220 kV level Dist. Patan
- Upgradation of 66 kV Mera to 220 kV level Dist. Banaskantha
- 220 kV Rah Dist. Banaskantha
- 220 kV Gariyadhar Dist. Amreli
- 220 kV Patkhilori Dist. Rajkot
- 220 kV Padana / Gandhidham-B Dist. Kutch
- 220 kV Bhesan Dist. Junagadh
- 220 kV Khodu/Dudhrej Dist. Surendranagar
- 220 kV Babarzar Dist. Jamnagar
- 220 kV Ghiyavad Dist. Rajkot
- 132 kV Supedi Dist. Junagadh



6.2 Status of the project:

Substation				Transmission Line	
Sr No	New EHV Substation planned				
1	1	220 kV Gariyadhar	Commissioned	Total No. of lines planned	278
2	1	132 kV Supedi	-	Tender done	183
	2	220 kV Mera	-	Work awarded	139
	3	220 kV Babarzar	-	Work Completed	29
	4	220 kV Ghiyavad	-		
	5	220 kV Patkhilori	-		
3	1	220 kV Bhesan	-		
	2	220 kV Bhildi	-		
	3	220 kV Sisrana	-		
	4	220 kV Rah	-		
	5	220 kV Padana	-		
	6	220 kV Khodu	-		



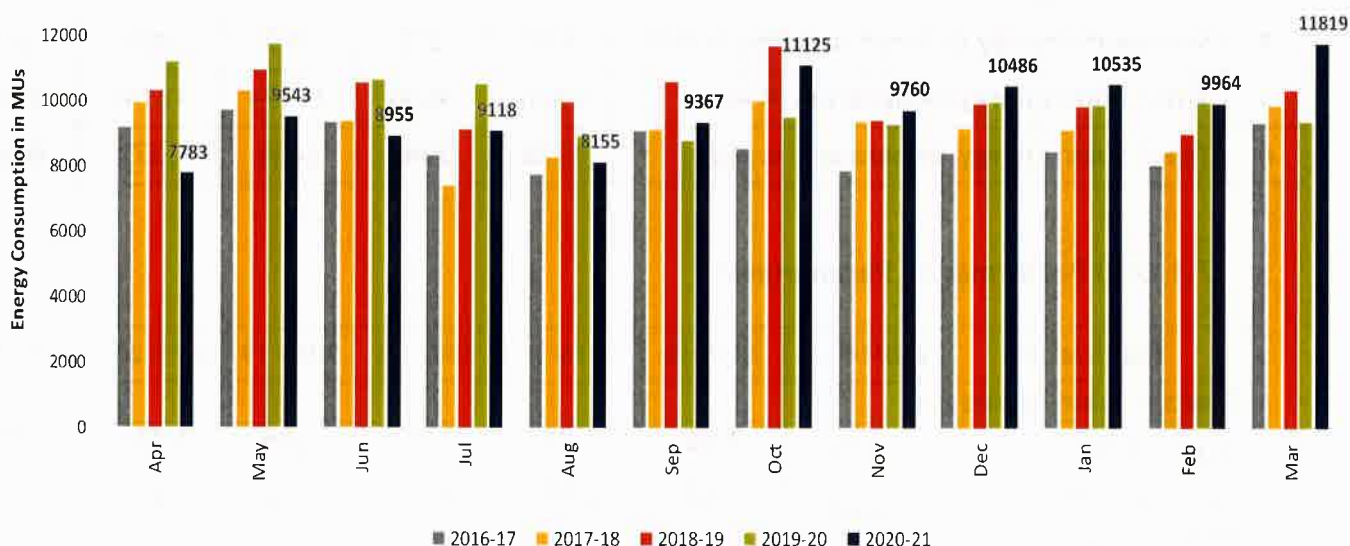
7.2 Month wise Maximum Unrestricted Demand & Maximum Demand Catered (MW) for the year 2020-21:(Source: SLDC)

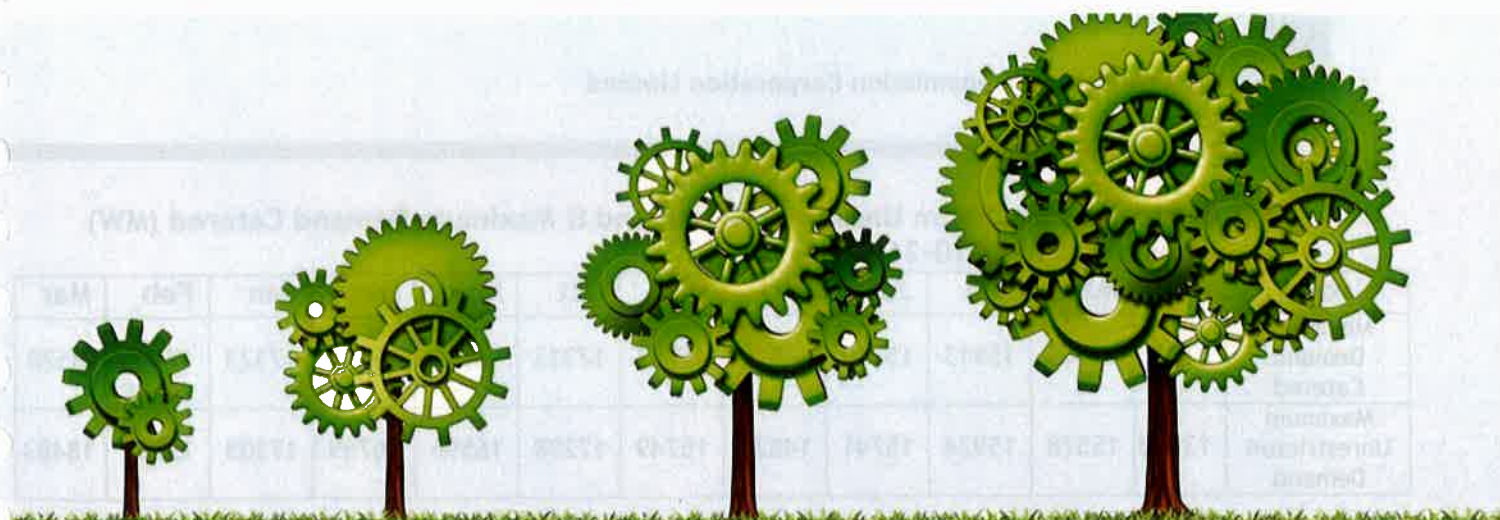
Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Maximum Demand Catered	13489	15589	15913	15719	14819	15732	17313	16573	16817	17323	17304	18528
Maximum Unrestricted Demand	13508	15578	15924	15741	14829	15749	17298	16596	16759	17305	17292	18483

7.3 Month wise Energy consumption (in Mus) of Gujarat State for the year 2020-21 is as follows: (Source: SLDC)

YEAR	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2016-17	9187	9736	9366	8353	7759	9105	8550	7890	8449	8495	8055	9340	104284
2017-18	9940	10341	9399	7427	8291	9168	10031	9394	9211	9166	8473	9898	110739
2018-19	10345	10962	10584	9139	9971	10614	11706	9424	9953	9869	9020	10351	121939
2019-20	11223	11758	10658	10551	8970	8829	9545	9299	9995	9907	9974	9421	120129
2020-21	7783	9543	8955	9118	8155	9367	11125	9760	10486	10535	9964	11819	116610

Month wise Energy Consumption of Gujarat State in MUs





7. Performance of GETCO

Performance of GETCO:

(Source: SLDC)

Sr. No.	Particulars	2016-17	2017-18	2018-19	2019-20	2020-21
1	Maximum Demand Catered in MW	15203	17097	18221	18424	18483
2	Maximum Unrestricted Demand in MW	15208	17097	18189	18437	18528
3	Total Energy Catered in a Year in MUs	104284	110739	121939	120129	116610
4	Maximum Energy Catered in a Day in MUs	334	373	403	401	397
5	Total Wind Energy Generation in MUs	7720	9636	11194	12147	9937
6	Total Solar Energy Generation in MUs	1738	2048	2408	3272	4051

7.1 Grid Performance Parameters:

Particulars	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Transmission losses (%)							
As per SLDC	3.76	3.76	3.88	3.75	3.95	3.72	3.50
As per Revised methodology #	3.65	3.68	3.85	3.72	3.92	3.68	3.41
S/S Availability (%)	99.86	99.85	99.86	99.87	99.88	99.89	99.89
Line Availability (%)	99.63	99.60	99.55	99.58	99.60	99.54	99.51
Note:- (#) the revised methodology of transmission losses calculation approved by the Hon'ble GERC							



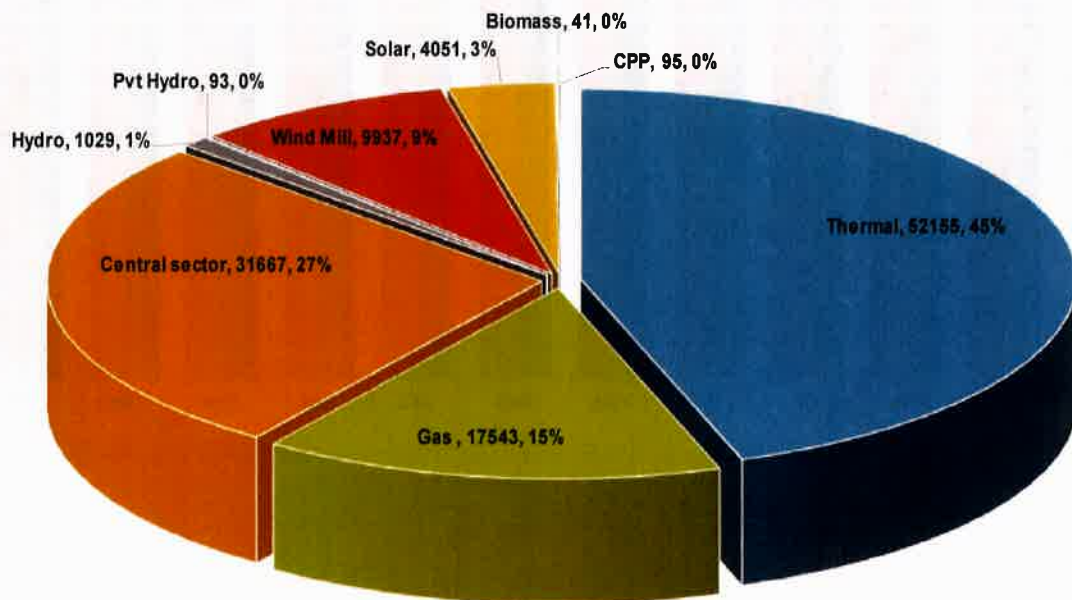
7.4 Yearly Energy consumption from different sources of Gujarat State is as follows: (in MUs):

(Source: SLDC)

Sr. No.	Sources	2018-19	2019-20	2020-21
1	GSECL	24954	20545	20759
2	State Own IPPs	6383	5977	8570
3	Other IPPs/CPP	24381	34620	29902
4	Torrent Power	9047	8321	7391
5	UNOSUGEN	-	2010	1929
6	DGEN (Infirm power)	-	709	1059
7	OPGS	1875	1542	1305
8	Central Sector	41621	30881	31667
9	Wind	11194	12147	9937
10	Solar	2408	3272	4051
11	Biomass	75	106	41
Total		121938	120129	116610

Fuel-wise Energy Consumption (MUs): FY 2020-21

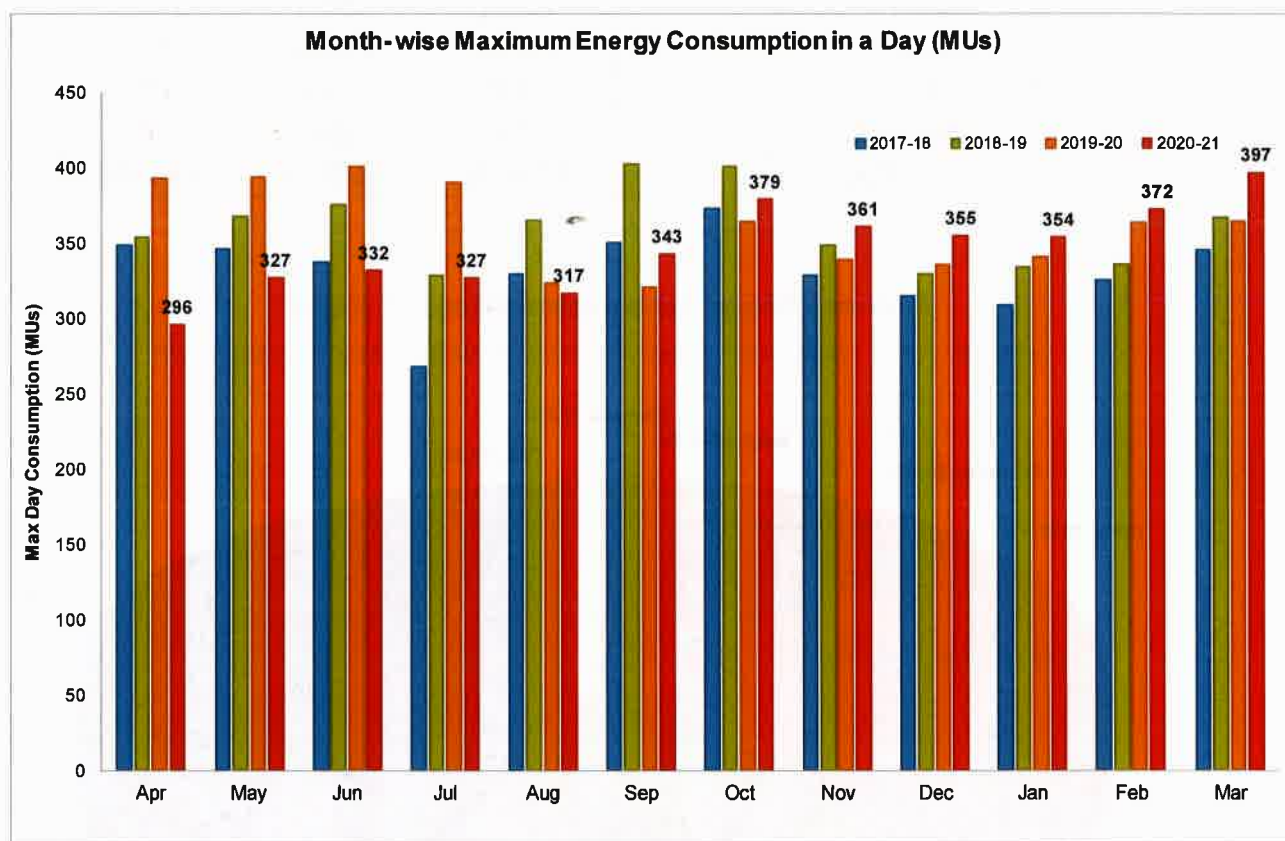
■ Thermal ■ Gas ■ Central sector ■ Hydro ■ Pvt Hydro ■ Wind Mill ■ Solar ■ Biomass ■ CPP





7.5 Month wise Maximum energy consumption in a day (MUs) of Gujarat State is as follows: (Source: SLDC)

YEAR	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Max. Energy (MUs)
2016-17	315	325	329	288	288	334	320	280	280	291	302	334	334
2017-18	349	346	338	268	330	351	373	329	315	309	325	345	373
2018-19	354	368	376	329	365	403	401	349	330	334	336	367	403
2019-20	393	394	401	391	324	321	365	339	336	341	364	365	401
2020-21	296	327	332	327	317	343	379	361	355	354	372	397	397



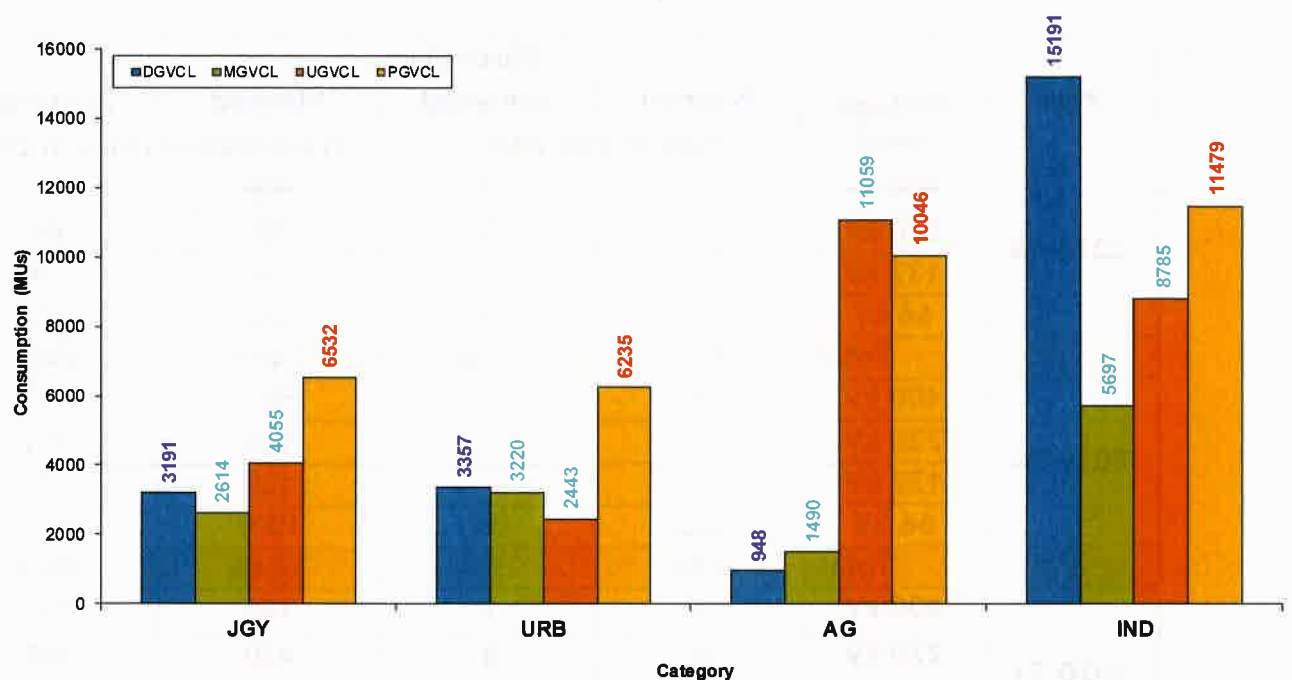


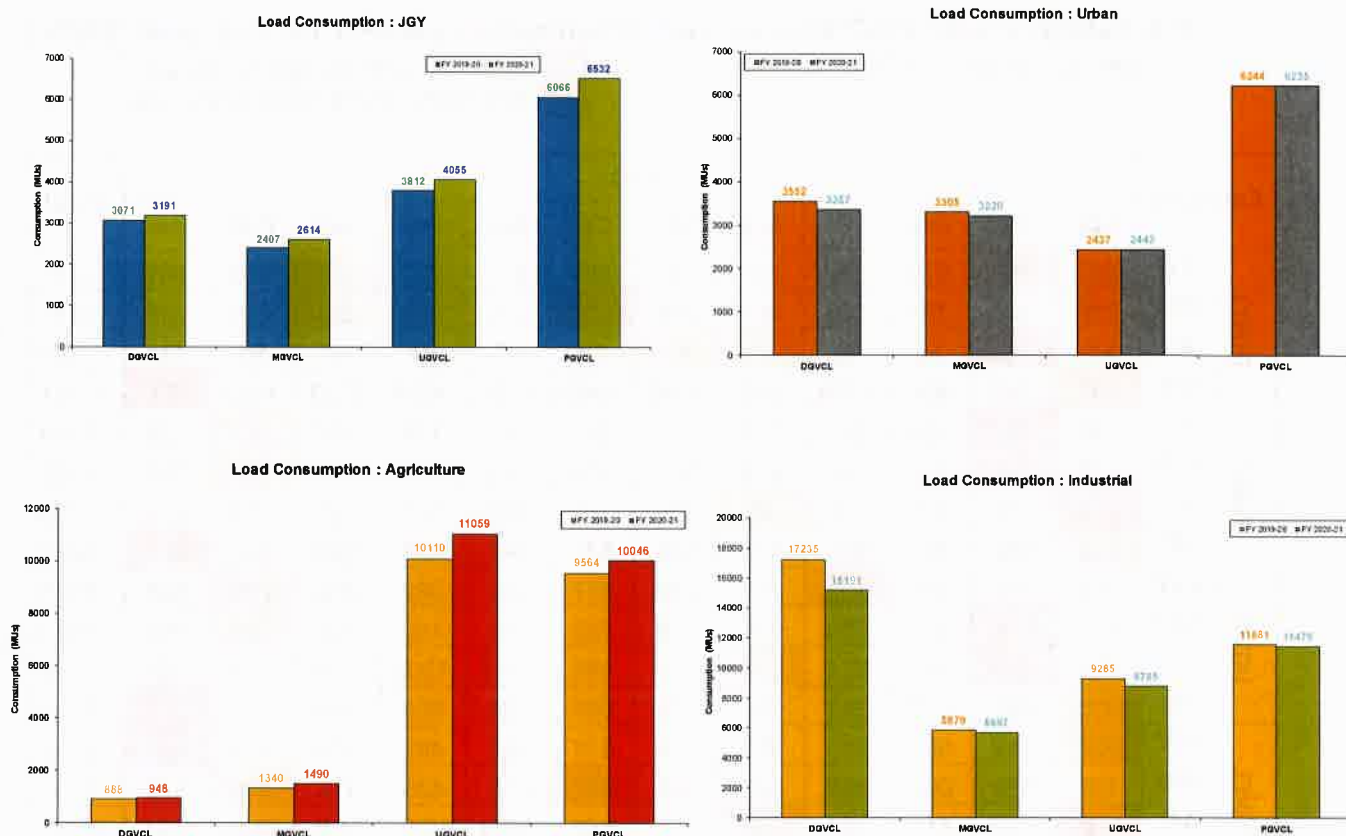
7.6 Category-wise DISCOM-wise load consumption pattern for the year 2020-21 (MUs): (Source: SLDC)

Minimum catered during the year
Maximum catered during the year

Category		Month												Total	Grand Total
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
DGVCL	JGY	292	324	275	294	256	267	289	227	220	219	228	301	3191	22687
	URB	286	334	301	290	261	298	335	244	230	223	229	325	3357	
	AG	141	142	59	40	13	13	68	97	64	84	96	131	948	
	IND	487	793	930	1074	1145	1345	1563	1387	1604	1633	1530	1701	15191	
MGVCL	JGY	226	256	224	251	226	237	245	187	178	179	173	232	2614	13022
	URB	272	363	332	330	278	301	304	201	195	188	187	270	3220	
	AG	190	174	61	95	55	69	140	142	107	135	150	174	1490	
	IND	238	430	467	520	499	538	533	446	496	503	485	541	5697	
UGVCL	JGY	315	380	378	402	378	390	377	268	269	265	264	368	4055	26342
	URB	187	258	253	254	221	238	232	150	150	146	145	208	2443	
	AG	1195	1240	761	624	271	435	888	1045	1206	1238	1036	1120	11059	
	IND	310	481	633	741	761	835	868	724	855	859	807	910	8785	
PGVCL	JGY	485	568	557	583	558	584	611	492	498	489	485	622	6532	34291
	URB	438	582	607	599	540	589	607	435	436	416	415	570	6235	
	AG	1170	1031	616	381	247	417	849	1004	1044	1131	1030	1125	10046	
	IND	313	585	804	971	973	1061	1145	1057	1154	1138	1068	1211	11479	

Load Consumption Pattern for FY 2020-21 : Category-wise & DISCOM wise





7.7 Physical Performance for the year 2020-21:

Year	Particulars				
	Voltage level	Planned	Achieved	Planned	Achieved
		Substations (Nos.)		Transmission Lines in CKm	
2018-19	400 kV	1	1	500	415
	220 kV	5	5	700	550
	132 kV	-	-	40	29
	66 kV	94	94	1200	1592
Total		100	100	2440	2586
2019-20	400 kV	1	-	563	183
	220 kV	7	1	965	453
	132 kV	-	-	120	90
	66 kV	132	54	1000	1241
Total		140	55	2648	1967
2020-21	400 kV	1	2	140	150
	220 kV	8	8	430	443
	132 kV	-	-	125	110
	66 kV	176	143	1330	1289
Total		185	153	2025	1993



7.8 Financial Performance for the year 2020-21:

(Amount in Rs. Crores)

Year	Capex	Capitalization
2017-18	2914	2216
2018-19	2773	2922
2019-20	2600	1900
2020-21	2026*	1830*

Note: (*) Provisional Figure

7.9 Key Challenges of GETCO Grid network:

Addition of new RE plants every year, increase both transmission bottlenecks and the need for new developing new transmission lines for their connectivity. It is pertinent to note that most of wind power is located in Kutch / Saurashtra area whereas solar power is located North Gujarat, Saurashtra and Kutch area. Further, RE development is being taken place in the remote areas wherein local consumption is very less and located far away from the major load centers.

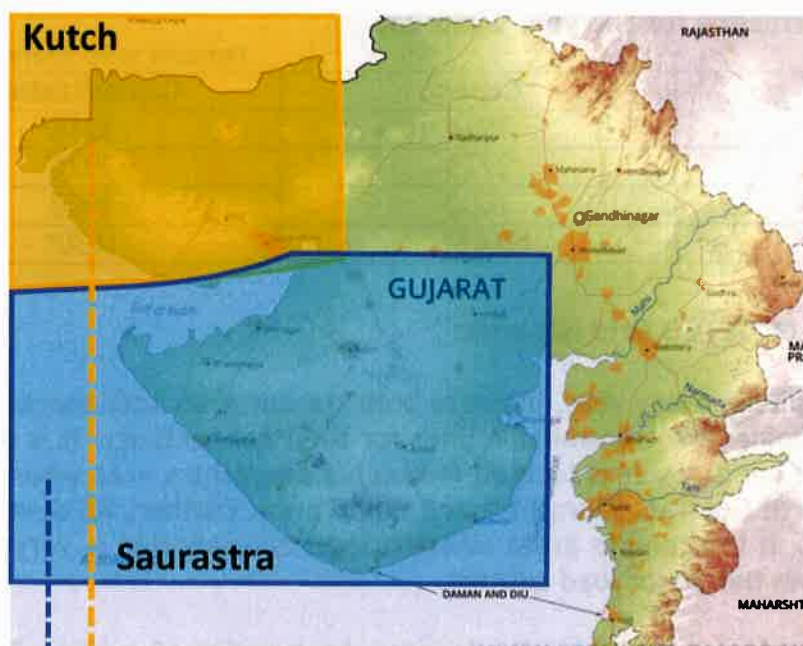
Thus, considering local consumption and adequacy / saturation of existing & already planned network, there is a strong need to plan new transmission infrastructure up to load centers for any further RE integration with Intra-State network.

Further, from the past profile of renewable energy generation, it has been observed that wind generation increases in other than peak demand period. The maximum wind generation available in monsoon season. Similarly, solar output is from 7:00 to 19:00 with peak ranging from 12:00 to 15:00. By shifting the agricultural demand in day time, optimal utilization of RE resources can be availed. With huge RE integration of 8000-9000 MW in near future in Gujarat state, implementation of day time power supply to agricultural sector will help in power purchase cost optimization and balanced grid operation by enabling consumption of solar generation in the grid and simultaneously would help in improving agricultural productivity and smooth integration of RE power into the grid.

The Region -wise transmission elements have been planned for system strengthening as well as for smooth evacuation of huge RE power anticipated in near future which will relief congestion in different pockets. Detailed schemes have been listed in Chapter - 6.

Under Green Energy Corridor Phase-I and II, transmission schemes have been planned specifically from renewable rich areas of Gujarat i.e. Saurashtra and Kutch to industrial pockets of Central and South Gujarat. Detailed schemes along with their status have been listed in Chapter - 7.

Apart from above, under Kisan Suryoday Yojana, new transmission lines and EHV substations have been planned to cater the additional demand by supply of daytime power to agricultural sector. Addition of 3800 CKM of 66 kV lines and 12 Nos of new EHV substations along with their associated lines, will strengthen the sub-transmission network of Gujarat grid thereby mitigating the transmission constraints in few pockets. Schemes planned under Kisan Suryoday Yojana along with their status have been listed in Chapter - 8.



Kutch –

Demand nature : Agricultural

Kutch is rain deficient region. Port industry has flourished in the area.

Generation:

Coal based plants of Adani Mundra & TATA UMPP whereas Lignite based KLTPS and Akrimota TPS are located in Kutch. The Region is abundant in Wind Farms.

Around 2500 MW RE already installed in the region. Further, 30 GW Khavda Hybrid Park under ISTS scheme approved in the region

Main transmission corridors getting loaded –

- 220 KV S/C Shivilakha – Sankhari line (175 MW)
- 220 KV S/C Tappar – Shivilakha (170-180 MW)
- 220 KV D/C Adani – Nanikhakhar line
- 220/440 KV, 2X315 MVA ICT's at APL, Mundra

Saurashtra –

Demand nature : Agriculture- Industrial

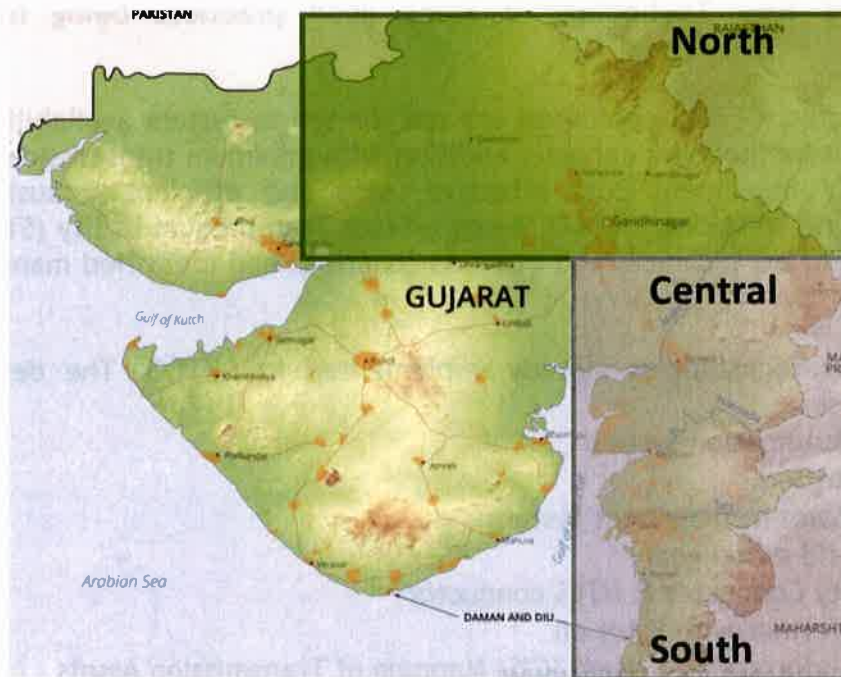
Rajkot, Morbi, Jamnagar are industrial pockets whereas Bhavnagar, Amreli, Botad, Junagadh are agricultural pockets.

Generation:

Thermal power plant Essar Vadinar, Sikka TPS, Lignite based Bhavnagar TPS and Gas based GSPC Pipavav are located in the area. RE rich region. More than 5000 RE already installed in the region and approval for 2500 MW capacity granted.

Main transmission corridors getting loaded –

- 220 KV D/C Amreli –Savarkundla (180-200 MW each)
- 220 KV S/C Hadala – Kangsyali line (180-225 MW)
- 220 KV Jetpur – Shapar line (180-200 MW)
- 220 KV Jetpur – Gondal line (170-220 MW)
- 132KV S/C Khambhalia – Jamnagar line (70-90 MW)
- 132 KV Nyara – Vajdi line (Around 70-80 MW)
- 132 KV Nyara – Vikram line (Around 70-80 MW)
- 132 KV Gondal – Jasdan line (Around 75 MW – 80 MW)
- 132 KV S/C Sartanpar – Waghasia line (70-85 MW)
- 132 KV S/C Wankaner – Sitagadh line (75-80 MW)



North Gujarat –

Demand nature : Agriculture
Agricultural pocket of Gujarat.

Generation:

Wankabori TPS, G'nagar TPS, Torrent – Ahmedabad TPS & Dhuvaran TPS located in the area.

RE potential on rise in the region with Charanka Solar Park, Raghnesda Solar Park and Harshad Solar Park. Approvals for 400 MW granted in the region.

Main transmission corridors getting loaded –

- 220 KV D/C Khanpur – Dehgam line: (180 MW - 200 MW each)
- 132 KV D/C Ranasan – Sabarmati line (70 – 85 MW each)
- 132 KV D/C Ranasan – Vatwa line (80-90 MW each)
- 132 KV S/C Dhuvaran – Mehemdabad line (70-85 MW)
- 132 KV S/C Dhuvaran – Undel line (70-85 MW)

South & Central Gujarat –

Demand nature : Industrial Hub of Chemical and Petro Chemical industries, textile industry, diamond industry.

Generation :

Gas based plants located in the pocket. Due to non-availability of Gas, less local generation available.

Main transmission corridors getting loaded –

- 220 KV D/C KAPP – Vapi line (180-190 MW each)
- 220 KV Kosamba – Kim line (200-220 MW)
- 220 KV D/C Kasor – Karamsad (200-215 MW each)
- 132 KV S/C Karamsad – Nadiad (85-100 MW)



7.10 Adoption of New Technology & Some good practices being followed regularly:

In transmission sector, GETCO objectives are not limited to system availability, grid reliability, transmission network capacity addition with minimum transmission losses, but simultaneously implement cost effective, safe and efficient & sustainable integrated smart grid solutions. GETCO, being a State Transmission Utility (STU), has done the mapping of all technical and business functions and identified many Smart Grid solutions.

The following new technologies already implemented in GETCO. The details as Annexure-6.

- Substation Automation System
- Digital Substation
- Integrated Asset Management System
- GIS and Hybrid switchgear
- High Capacity Conductor & HTLS conductor
- Power transformer with Ester oil
- Geographic Information System (GIS) Mapping of Transmission Assets
- Wind Forecasting & Scheduling
- Real Time Grid Visualization
- Static Synchronous Compensator (STATCOM)
- OPGW

Eventually, some good practices are being followed regularly and consistently in GETCO, details as Annexure-6.



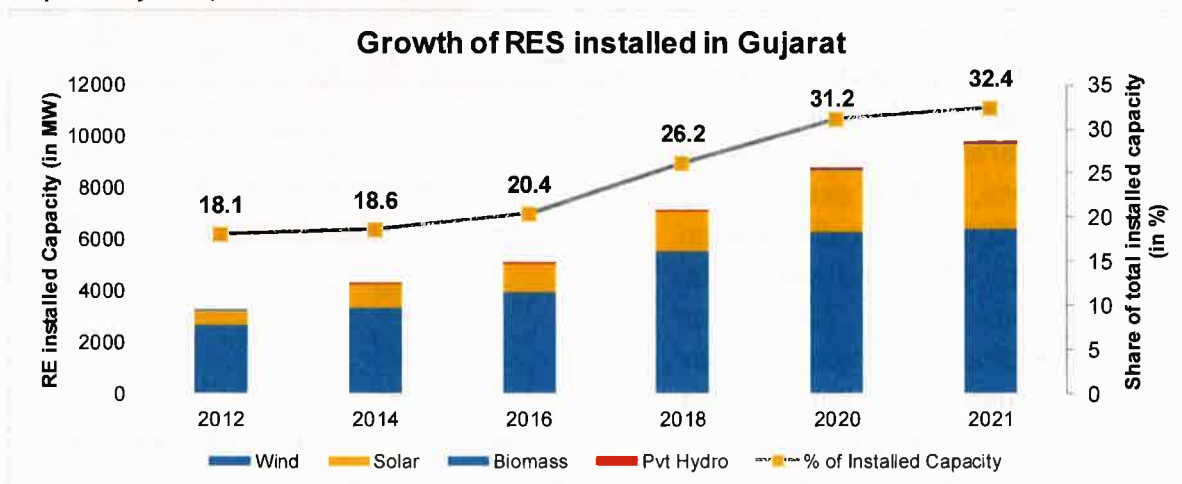
8. Renewable Energy (RE) Integration

8.1 RE Growth trends and Outlook:

Among all the states of India, Gujarat is one of the pioneer states in Renewable energy development. Due to its geographical location, it is one of the promising states in India in regard to RE potentialities.

In terms of solar energy, the state has been blessed with 300+ days of sunshine whereas 1600 Kms of coastline boasts wind potential of the region. To align with India's ambitious target of 175 GW by 2022, the State envisages to accelerate deployment of Renewables by means of large scale projects, small scale distributed systems, establishment of ultra-mega solar parks, hybrid (wind-solar) projects, exploring possibility of off-shore wind projects.

At present, the share of renewables in the Gujarat state have significantly increased in past 9 years, from 18% in 2012 to 32% in 2021.

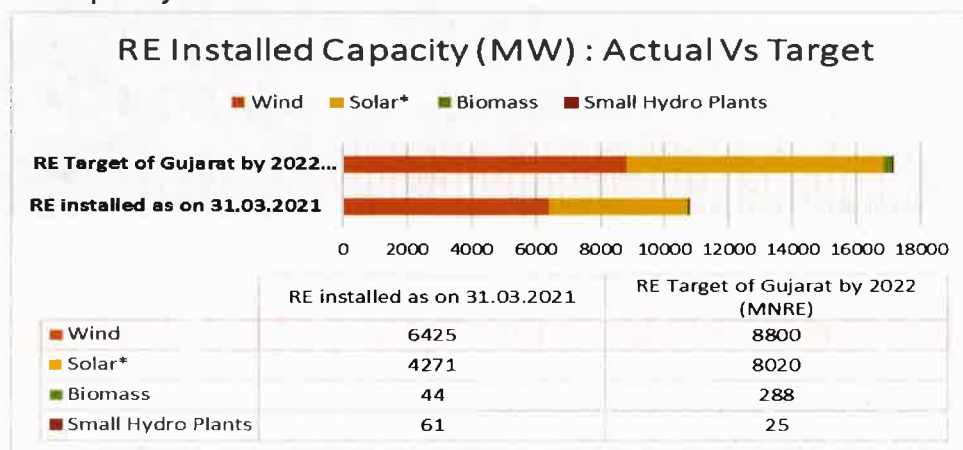


Further, State of Gujarat contributes around 10% to India's renewable energy basket of 95013 MW whereas Gujarat's share of RE sources in Western Region is 33 % of total RE capacity of 29624 MW.

The 175 GW renewable energy target the Government of India has set to achieve by 2022, the state of Gujarat has been allocated the target of 17,133 MW of renewable



energy. This includes 8,800 MW of wind, 8,020 MW of solar, 288 MW of bio-power and 25 MW SHP capacity.



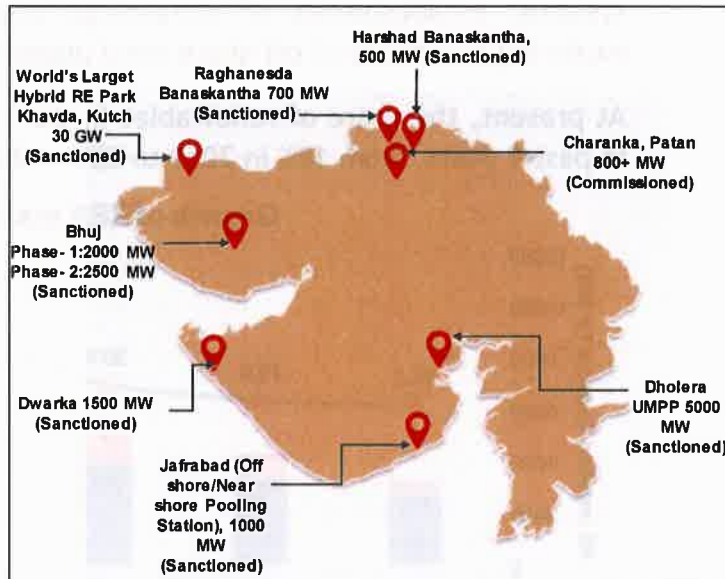
Note: Solar capacity of 4271 MW is including 3266 MW of installed Total RE and 1005 MW of Rooftop Solar projects

State Road Map for RE capacity addition

To achieve the target set by Government of India, around 7000 MW of renewables is to be integrated in the State. Following proposals have been planned in Gujarat-

- Gujarat has taken up proposal for establishing India's 5000 MW solar park in Dholera. Out of 5000 MW, 1000 MW capacity is bid out by GUVNL and balance 4000 MW capacity will be bid out by Solar Energy Corporation of India (SECI).

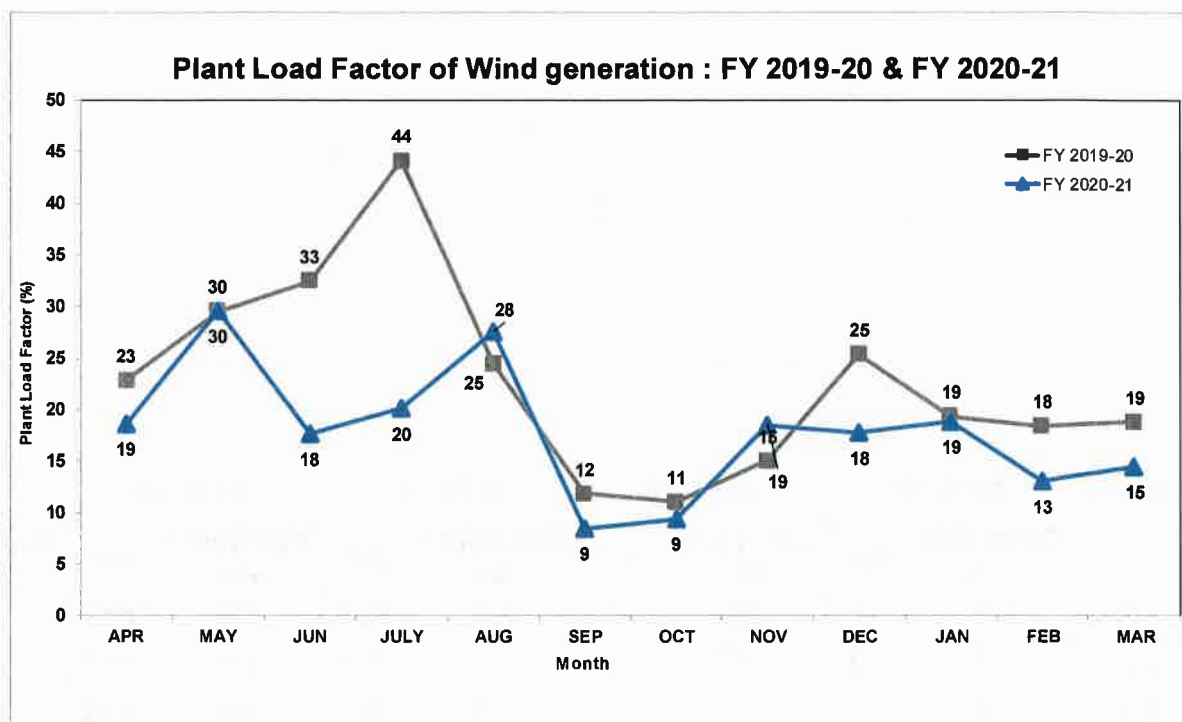
- The Radhanesda Solar Park project, second biggest solar park after Charanka Solar park in state, will be executed by GETCO in collaboration with GPCL and MNRE, for evacuation of 700 MW at Radhanesda village of Vav taluka in Banaskantha district along with another 500 MW solar park at Harshad in Banaskantha.



- With solar-subsidies, Gujarat has set its pace to install around 900 MW solar roof top projects all over the state in the timeframe of 2022.
- Around 2500 MW of RE capacity is aimed through development of Small Scaled Distributed RE projects.
- Apart from this, around 1500 MW RE capacity is planned through grid connected solar projects around various substations of GETCO.



8.2 Plant Load Factor (PLF) of Wind Generation:



(Source: SLDC)

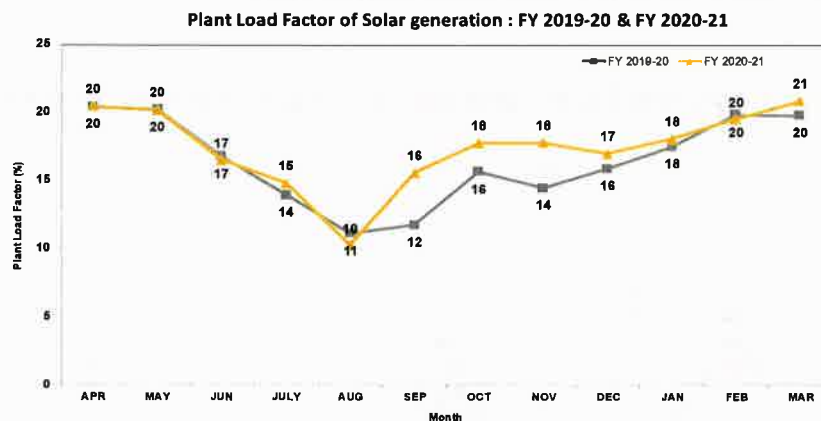
Month	2016-17		2017-18		2018-19		2019-20		2020-21	
	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF
APR	500	18	947	25	717	18	952	23	845	19
MAY	992	34	1242	31	1168	28	1278	30	1388	30
JUN	1026	36	1126	29	1633	41	1375	33	801	18
JULY	1041	34	1476	37	1661	40	1962	44	944	20
AUG	908	30	1086	27	1481	35	1103	25	1296	28
SEP	631	21	402	10	803	20	521	12	387	9
OCT	255	8	387	9.5	297	7	509	11	444	9
NOV	259	9	512	13	384	9	674	15	844	19
DEC	389	12	871	21	775	18	1181	25	840	18
JAN	569	18	473	12	768	18	905	19	897	19
FEB	551	18	441	12	741	19	806	18	561	13
MAR	591	17	673	16	768	18	879	19	689	15
Total	7720	21	9636	20	11194	23	12147	23	9937	18

8.3 Wind-farm installed capacity and associated substation up to March-2021:

The list of Wind farms commissioned in the State of Gujarat by March 2021 is attached as Annexure -4.



8.4 Plant Load Factor of Solar generation: -



(Source: SLDC)

Month	2016-17		2017-18		2018-19		2019-20		2020-21	
	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF	Generated MUs	PLF
APR	171	22	186	21	220	20.5	310	20.4	357	20
MAY	166	20	187	20	216	19.5	324	20.3	365	20
JUN	139	17	154	17	174	16.1	266	16.8	290	17
JULY	103	13	90	9.6	126	11.3	232	13.9	269	15
AUG	95	12	131	14	120	10.7	187	11.1	187	10
SEP	141	18	169	17	170	15.6	191	11.7	276	16
OCT	147	18	193	18	200	17.7	266	15.7	328	18
NOV	148	19	168	16	200	17.8	238	14.5	328	18
DEC	151	18	162	15	208	17.0	271	15.9	350	17
JAN	149	18	195	18	233	18.7	306	17.5	404	18
FEB	152	20	183	18	237	19.2	326	19.9	411	20
MAR	176	21	231	21	302	21.2	356	19.8	485	21
Total	1738	18	2048	17	2408	17.2	3272	16.4	4051	17

8.5 Solar Generation plant installed capacity and evacuation lines up to March-2021: -

Sr. No.	Solar Generating Plants	Installed Capacity (MW)*
1	Solar Generation plants across the State	2174
2	Solar Generation plants under Charanka Solar Park	848
3	Solar Generation plants connected at 11 kV level	244
Total		3266
Roof Top Solar Capacity		1005

The detailed list of Solar Plants commissioned in the State of Gujarat by March 2021 is attached as Annexure -5.

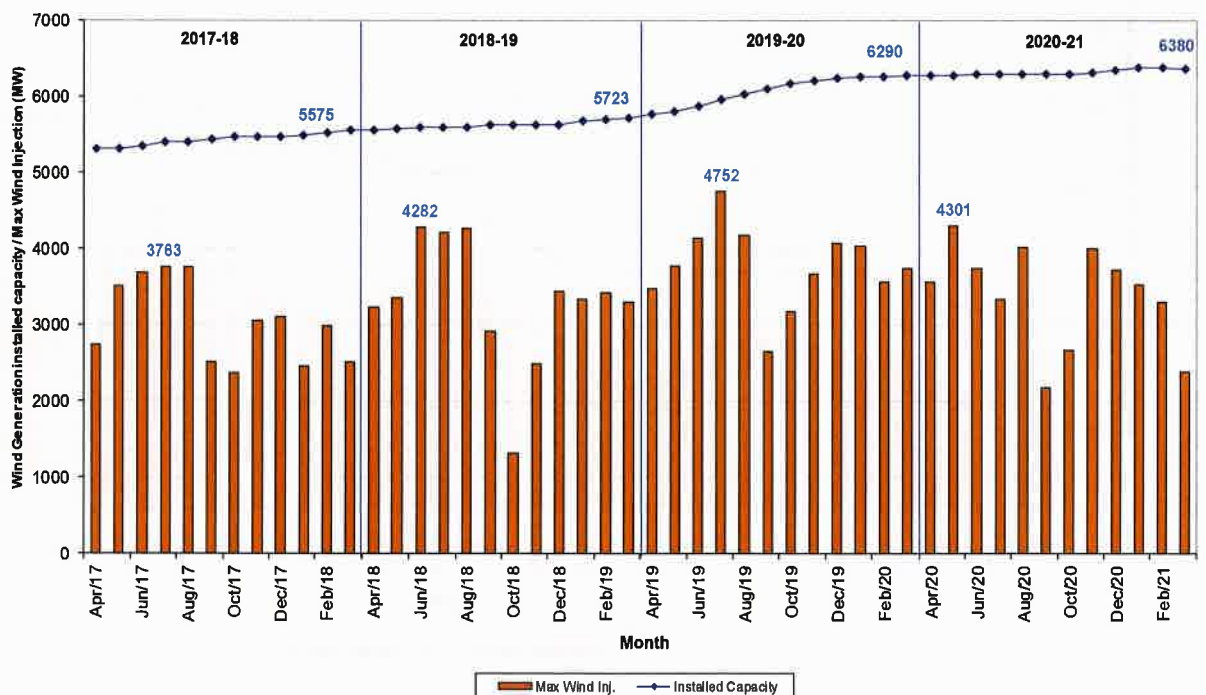


8.6 Month wise installed capacity and injection of Wind & Solar in MW during the year 2020-21: (Source: SLDC)

8.6.1 Wind generation integration:

Month	Wind Generation							
	Installed Capacity	Maximum Wind injection	Installed Capacity	Maximum Wind injection	Installed Capacity	Maximum Wind injection	Installed Capacity	Maximum Wind injection
	2017-18		2018-19		2019-20		2020-21	
APR	5318	2745	5581	3237	5784	3479	6290	3568
MAY	5318	3517	5595	3359	5813	3772	6292	4301
JUN	5350	3690	5607	4282	5875	4145	6299	3740
JUL	5405	3763	5609	4212	5972	4752	6309	3332
AUG	5407	3760	5629	4262	6046	4179	6308	4022
SEP	5441	2512	5639	2914	6105	2652	6308	2171
OCT	5472	2363	5639	1316	6174	3177	6302	2678
NOV	5480	3062	5639	2491	6215	3673	6328	4011
DEC	5483	3114	5692	3441	6254	4080	6352	3721
JAN	5502	2452	5703	3331	6278	4034	6388	3537
FEB	5525	2993	5723	3419	6278	3564	6390	3299
MAR	5575	2512	5784	3305	6290	3748	6380	2386
Max.	-	3763	-	4282		4752		4301

Wind Generation Integration

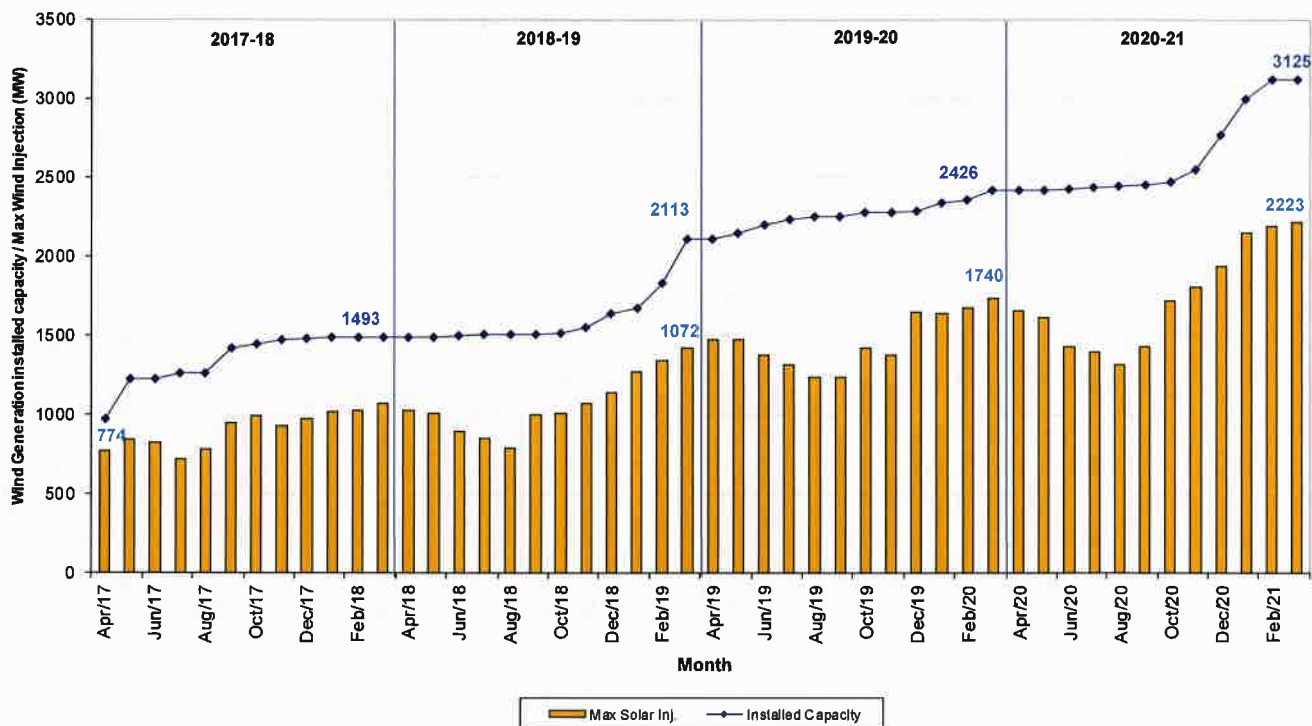




8.6.2 Solar generation integration:

Month	Installed Capacity	Maximum Solar Injection	Installed Capacity	Maximum Solar Injection	Installed Capacity	Maximum Solar Injection	Installed Capacity	Maximum Solar Injection
	2017-18		2018-19		2019-20			
APR	1230	885	1493	1029	2113	1476	2426	1663
MAY	1230	846	1501	1011	2148	1472	2426	1620
JUN	1230	829	1508	896	2201	1377	2436	1435
JUL	1262	716	1514	849	2243	1318	2442	1400
AUG	1265	785	1514	790	2257	1241	2453	1314
SEP	1424	952	1519	1004	2257	1234	2460	1429
OCT	1449	991	1558	1008	2282	1424	2476	1725
NOV	1476	930	1644	1075	2282	1378	2556	1811
DEC	1483	978	1681	1140	2291	1647	2772	1941
JAN	1493	1020	1836	1272	2347	1645	3006	2154
FEB	1493	1027	1919	1347	2362	1676	3125	2198
MAR	1493	1072	2113	1425	2426	1740	3125	2223
Max.	--	1072		1425		1740		2223

Solar Generation Integration



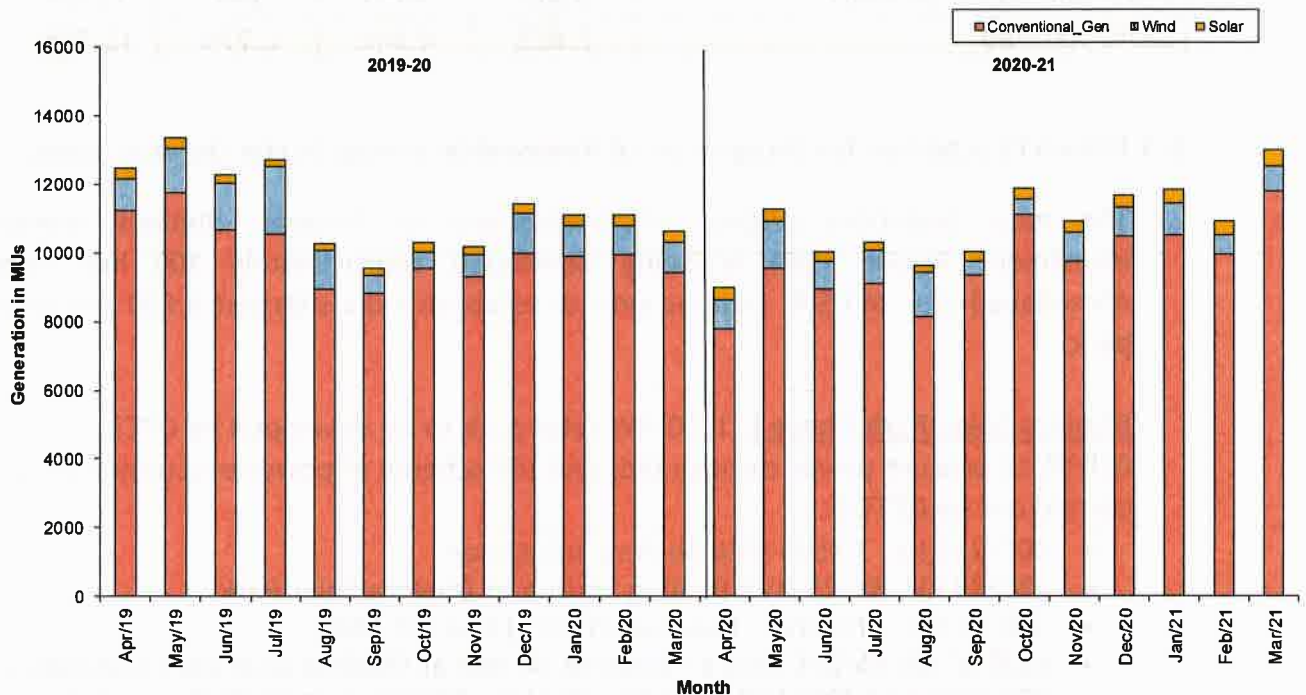


8.7 Month wise Generation in MUs and contribution of Renewable Energy for the year 2020-21:

(Source: SLDC)

Sr. No.	Month	2019-20				2020-21			
		Total Generation	Wind	Solar	%Contribution of RE	Total Generation	Wind	Solar	%Contribution of RE
1	Apr	11223	952	310	11.2	7783	845	357	15.4
2	May	11758	1278	324	13.6	9543	1388	365	18.4
3	Jun	10658	1375	266	15.4	8955	801	290	12.2
4	Jul	10551	1962	232	20.8	9118	944	269	13.3
5	Aug	8970	1103	187	14.4	8155	1296	187	18.2
6	Sep	8829	521	191	8.1	9367	387	276	7.1
7	Oct	9545	509	266	8.1	11125	444	328	6.9
8	Nov	9299	674	238	9.8	9760	844	328	12.0
9	Dec	9994	1181	271	1.5	10486	840	350	11.3
10	Jan	9907	905	306	12.2	10535	897	404	12.3
11	Feb	9974	806	326	11.4	9964	561	411	9.8
12	Mar	9421	879	356	13.1	11819	689	485	9.9
Total...		120129	12147	3273	12.8	116610	9936	4050	12.0

Month-wise Conventional generation and RE generation : FY 2019-20 & FY 2020-21





8.8 Power purchase from renewable sources RPPO for the year 2020-21:

(Source: GUVNL)

2018-19	In Million Units			
	Wind	Solar	Others	Total
RPPO%	7.95%	4.25%	0.50%	12.70%
Energy Required to meet RPPO	7058	3773	444	11275
Units purchased (Actual)	8010	2455	224	10689
RPPO fulfilled	9.02%	2.77%	0.25%	12.04%

2019-20	In Million Units			
	Wind	Solar	Others	Total
RPPO%	8.05%	5.50%	0.75%	14.30%
Energy Required to meet RPPO	7314	4997	681	12992
Units purchased (Actual)	8325	3270	343	11938
RPPO fulfilled	9.16%	3.60%	0.38%	13.14%

2020-21 (Provisional)	In Million Units			
	Wind	Solar	Others	Total
RPPO%	8.15%	6.75%	0.75%	15.65%
Energy Required to meet RPPO	7496	6208	690	14393
Units purchased (Actual)	7005	4455	244	11704
RPPO fulfilled	7.62%	4.84%	0.27%	12.73%

8.9 Intra-STC schemes for integration of Renewable energy in the Gujarat State:

The most ambitious project of Government of Gujarat, Dholera Special Investment Region (SIR) is being developed approximately 100 Km from Ahmedabad city. In DSIR, Gujarat aims to establish India's largest 5,000 MW solar park.

Dholera Solar Park Phase I: 1000 MW solar park to be developed by GPCL, GUVNL to procure power through bids and the scheme of power evacuation to be carried out by GETCO.

- 400/220 kV, 3 X500 MVA Dholera substation
- 220/33 kV, 8X125 MVA Pooling Station at Dholera Solar Park
- 400 kV D/C Dholera - Paccham (Fedra) line (31 RKM)
- LILO of 400 kV D/C Fedra - Dholera 'A' line at Dholera solar park substation (Extension of 400 kV D/C Fedra - Dholera "AA" line up to Dholera solar substation (15 RKM)



8.10 ISTS Schemes for integration of Renewable energy from Gujarat State:

❖ Raghanesda Solar Park (750 MW) & Harshad Solar Park (500 MW)

Substations:

1. 220/33 kV Substation at Raghanesda solar park
2. 220/33 kV Substation at Harshad solar park

Transmission Lines:

1. 400 kV D/C Vav (PGCIL) - Banaskantha (765 kV) line (80 RKM) (Commissioned)
2. 220 kV D/C Vav (PGCIL) - Raghanesda line (35 RKM) (Under-Construction)
3. 220 kV D/C Vav (PGCIL) - Harshad line (35 RKM) (Sanctioned)

❖ RE Projects in Gujarat:

The following RE projects will be developed in the Gujarat state

- Bhuj: 4000 MW (Wind power capacity already granted)
- Dwarka: 1500 MW (150 MW Wind power capacity already granted)
- Bhuj-II: 2000 MW

❖ Transmission corridors for RE Projects in Gujarat:

1) Transmission system augmentation:

- 400/220 kV 6X500 MVA (additional) ICTs at Bhuj Pooling station
- 765/400 kV 2X1500 MVA (additional) ICTs at Bhuj Pooling station
- LILO of 400 kV Zerda - Vadavi line at 765 kV Banaskantha substation

2) Transmission system for RE projects in Kutch area

- 765/400 kV 3x1500MVA & 400/220 kV 4x500MVA ICTs Bhuj-II PS
- 765/400 kV 2x1500MVA & 400/220 kV 4x500MVA ICTs at 765/400/220 kV Lakadia PS
- Interconnection of 765 kV Bhuj Pooling Station with the proposed Bhuj-II S/s through bus extension or 765 kV D/c line
- 765 kV D/C Bhuj-II - Lakadia PS line
- 765 kV D/C Lakadia PS - Vadodara line
- 765 kV D/C Lakadia PS - Banaskantha line
- LILO of both Circuits of 400 kV Essar - Bhachau line at 765 kV Lakadia S/s

3) Transmission system for RE projects in Devbhumi Dwarka area

- 400/220 kV 4x500MVA ICTs Jam Khambhaliya PS
- Extension of 400 kV D/C Essar - Bhachau line upto 400 kV Jam Khambhaliya PS
- LILO of 400 kV D/C Jamkhambhaliya - Bhachau (above line) at Lakadiya substation

❖ Khavda Wind-Solar Hybrid RE Park (30,000 MW)

In December, 2020 Hon'ble Prime Minister laid the foundation stone for world's largest renewable energy park in Gujarat's Kutch. This 30 GW capacity hybrid renewable energy park will be built along Indo-Pak border at Khavda using both wind and solar energy.



Phase-wise transmission scheme planned for evacuation of 7.5 MW RE power from potential RE zones in Khavda region is as under -

Phase-1 For 3000 MW at Khavda Pooling station

- Establishment of Khavda 765/400 kV 3x1500 MVA & 400/220 kV, 4x500MVA Pooling station (GIS)
- 765 kV 1X330 MVAR bus reactor and 400 kV 1X125 MVAR bus reactor
- Khavda Pooling station (GIS) - Bhuj Pooling station 765 D/C line
- Two bus sections with bus sectionalizer to be created at 765 kV and 400 kV level.
- Spare transformers and reactors

Phase-2 For 4500 MW at Khavda Pooling station

- Augmentation of Khavda Pooling station (GIS) by 765/400 kV 4x1500 MVA ICTs and 400/220 kV 2X500 MVA ICTs. Provision of 765 kV, 1X330 MVAR and 400/220 kV, 1x125 MVAR bus reactor on second 765 kV and 400 kV bus respectively.
- Khavda PS (GIS) - Lakadia PS 765 kV D/C line with 330 MVAR line reactors at Khavda end.
- Lakadia PS - Ahmedabad 765 kV D/C line with 240 MVAR line reactors on both ends
- Establishment of Ahmedabad 765/400 kV, 2X1500 MVA S/S with of 765 kV, 1X330 MVAR and 400/220 kV, 1x125 MVAR bus reactor (towards eastern side of Ahmedabad) along with associated 400 kV interconnections (LILO of Pirana (PG) - Pirana (T) 400 kV D/C line at Ahmedabad S/s with twin HTLS along with reconductoring of Pirana (PG) - Pirana(T) line with twin HTLS conductor)
- Ahmedabad - Indore 765 kV D/C line with 330 MVAR line reactors on both ends
- Ahmedabad - Vadodara 765 kV D/C line
- 220 kV line bays for interconnection of solar projects (4 nos); Implementation of which shall be taken up as per the LTA/connectivity granted at 220 kV level.
- Spare reactors and transformers

❖ **Transmission system for evacuation of power from Dholera UMSP for 4000 MW (Phase-1)**

- Establishment of 400 kV Dholera Pooling station (Injection of power from the Solar Park at 400 kV level) along with 400 kV, 1x125MVA bus reactor
 - LILO of both circuits of Vadodara- Pirana (PG) 400 kV D/C line at Dholera pooling station.
- MNRE and NIWE aims to develop the first offshore/ near shore wind project of India with an installed capacity of 1000 MW near coast of Gujarat, approx. 25 Km from Jafrabad.

9. Annexures

Annexure-1: List of 66 kV Substations commissioned during April-2020 to March-2021

Sr. No.	Name of Substation	Name of District	Name of Taluka	Scheme
DGVCL				
1	66 kV Sengpur (Kapodara) (Bakrol)	Bharuch	Ankleshwar	TASP
2	66 kV Sunevkhard	Bharuch	Hansot	Coastal
3	66 kV Avidha	Bharuch	Zagadiya	TASP
4	66 kV Vanakpore (Umadhara)	Bharuch	Zagadiya	TASP
5	66 kV Selod / Malpore (220 kV Zagadiya)	Bharuch	Zagadiya	TASP
6	66 kV Khaidipada (Borphita)	Narmada	Dediyapada	TASP
7	66 kV Katkoi	Narmada	Tilakwada	TASP
8	66 kV Namalpur (Savli / shira / Devaliya / Namalgadh)	Narmada	Tilakwada	TASP
9	66 kV Beddha (Kherwada)	Surat	Mandvi	TASP
10	66 kV Patna (Baudhan)	Surat	Mandvi	TASP
11	66 kV Kosamba-2	Surat	Mangrol	TASP
12	66 kV Simodra (Limbadra)	Surat	Mangrol	TASP
13	66 kV Kharach-II (Tarsali / Hathuran / Utiyadara / Kunvarda)	Surat	Mangrol	TASP
14	66 kV Sadadvel	Navsari	Chikhli	TASP
15	66 kV Gadat	Navsari	Gandevi	TASP
16	66 kV Mendhar Bhat	Navsari	Gandevi	Coastal
17	66 kV Abrama	Navsari	Jalalpore	Coastal
18	66 kV Tavdi (Viraval)	Navsari	Jalalpore	Coastal
19	66 kV Dandi	Navsari	Jalalpore	Coastal
20	66 kV Lachhakdi	Navsari	Vansda	TASP



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21	66 kV Vangan	Navsari	Vansda	TASP
22	66 kV Miyawadi (Kadod-2)	Surat	Bardoli	TASP
23	66 kV Mandroi	Surat	Olpad	Coastal
24	66 kV Segvachhama	Surat	Olpad	Coastal
25	66 kV Laxminarayan Ind. Estate	Surat	Surat City	ND
26	66 kV Borikuva	Tapi	Kukarmunda	TASP
27	66 kV Hathoda (Tapi)	Tapi	Kukarmunda	TASP
28	66 kV Higni Digar (Pankhala / Piplod / Dumkhal)	Tapi	Nizar	TASP
29	66 kV Vadpada P Umarda	Tapi	Songadh	TASP
30	66 kV Degama (Bajipura)	Tapi	Valod	TASP
31	66 kV Kelkui	Tapi	Vyara	TASP
32	66 kV Lotarva	Tapi	Vyara	TASP
33	66 kV Tiskari Talat	Valsad	Dharampur	TASP
34	66 kV Tukwada	Valsad	Pardi	TASP
35	66 kV Umarsadi	Valsad	Pardi	TASP
36	66 kV Ambach (Balda)	Valsad	Pardi	TASP
37	66 kV Manekpore (Manda)	Valsad	Umargam	Coastal
38	66 kV Moti Tambadi	Valsad	Vapi	TASP
MGVCL				
39	66 kV Bavaka (Gadoi)	Dahod	Dahod	TASP
40	66 kV Kanthagar (Sangdapada)	Dahod	Fatepura	TASP
41	66 kV Chhaparvad	Dahod	Singvad	TASP
42	66 kV Kajli (Dodiya)	Mahisagar	Kadana	TASP
43	66 kV Sadhakpur (Dhamod)	Mahisagar	Lunawada	ND
44	66 kV Dholi (Bodidra Bujarge)	Panchmahal	Godhra	TASP
45	66 kV Gollav	Panchmahal		TASP
46	66 kV Kantha (Boriya)(Panam Dam)	Panchmahal	Sahera	ND
47	66 kV Khandiya	Panchmahal		ND
48	66 kV Ladhod	Chhotaudepur	Bodeli	TASP
49	66 kV Simal faliya (Harwant)	Chhotaudepur	Chota udepur	TASP
50	66 kV Bediya	Chhotaudepur	Kawant	TASP
51	66 kV Thambhala (Sajva)	Chhotaudepur	Pavi jetpur	TASP
52	66 kV Rampura	Chhotaudepur	Sankheda	ND
53	66 kV Chikhodra	Anand	Anand	ND
54	66 kV Bamangam	Anand	Anklav	ND
55	66 kV Khakhasar (Rohini Chokdi)	Anand	Tarapur	ND
56	66 kV Shihora (Khanpur / Telnal)	Kheda	Kapadvanj	ND



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57	66 kV Kathoda (Baliya Dev Chokadi)	Kheda	Matar	ND
58	66 kV Mor Aambli	Kheda	Thasra	ND
59	66 kV Bhanthala	Mahisagar	Balasinor	ND
UGVCL				
60	66 kV Kuski	Himatnagar	Aravalli	TASP
61	66 kV Vankaner	Himatnagar	Aravalli	TASP
62	66 kV Panchal	Himatnagar	Aravalli	TASP
63	66 kV Limbhoi	Himatnagar	Aravalli	ND
64	66 kV Chandtekri (Modasa City)	Himatnagar	Aravalli	ND
65	66 kV Derol	Himatnagar	Sabarkantha	ND
66	66 kV Didhiya	Himatnagar	Sabarkantha	TASP
67	66 kV Gudel (Angiya)	Himatnagar	Sabarkantha	TASP
68	66 kV Delvada (Matarvada)	Himatnagar	Sabarkantha	TASP
69	66 kV Ukardi	Mehsana	Ahmedabad	ND
70	66 kV Bhagapura	Mehsana	Ahmedabad	ND
71	66 kV Samalapati (Chormapura)	Mehsana	Patan	ND
72	66 kV Paldi Kankaj	Nadiad	Ahmedabad	ND
73	66 kV Bakrol Bujrang	Nadiad	Ahmedabad	ND
74	66 kV Chandisar (Keliya Vasna)	Nadiad	Ahmedabad	ND
75	66 kV Hirapur (Bol GIDC Sanand II)	Nadiad	Ahmedabad	ND
76	66 kV Mirapur	Nadiad	Gandhinagar	ND
77	66 kV Sanath (Sandiya)	Palanpur	Banaskantha	ND
78	66 kV Rampura Dama	Palanpur	Banaskantha	ND
79	66 kV Rupal	Palanpur	Banaskantha	ND
80	66 kV Godha	Palanpur	Banaskantha	ND
PGVCL				
81	66 kV Gigasan	Amreli	Dhari	ND
82	66 kV Amrutpur (Jeera)	Amreli	Dhari	ND
83	66 kV Surya Pratapgadh (Anida)	Amreli	Kukavav-vadiya	ND
84	66 kV Machiyala (400 kV Amreli)	Amreli	Kukavav-vadiya	ND
85	66 kV Vavera	Amreli	Rajula	Coastal
86	66 kV Goradaka (Jabal)	Amreli	Savarkundla	ND
87	66 kV Randola	Bhavnagar	Palitana	ND
88	66 kV Jasapara	Bhavnagar	Talaja	Coastal
89	66 kV Sarva	Botad	Botad	ND
90	66 kV Samadhiyala-1 Bhambhan (Tajpar)	Botad	Botad	ND
91	66 kV Ugamedi	Botad	Gadhada	ND
92	66 kV Jakhau	Kutch	Abadasa	Coastal



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93	66 kV Chandrani (Ambapar)	Kutch	Anjar	Coastal
94	66 kV Nana Luhariya (Chandiya)	Kutch	Anjar	Coastal
95	66 kV Bharapar	Kutch	Bhuj	ND
96	66 kV Kalitalavadi	Kutch	Bhuj	ND
97	66 kV Modsar	Kutch	Bhuj	ND
98	66 kV Nadapa	Kutch	Bhuj	ND
99	66 kV Pipari (Piyava)	Kutch	Mandvi	Coastal
100	66 kV Deshalpar (Kanthi)	Kutch	Mundra	Coastal
101	66 kV Beru	Kutch	Nakhatrana	Coastal
102	66 kV Gagodar	Kutch	Rapar	ND
103	66 kV Trajpar (Shobheshvar)	Morbi	Morbi	Coastal
104	66 kV Lalpar (Old rafaleshwar road)	Morbi	Morbi	Coastal
105	66 kV Bhut Kotda (Chhatar)	Morbi	Tankara	ND
106	66 kV Dhuva (Makansar)	Morbi	Wankaner	ND
107	66 kV Devda	Rajkot	Gondal	ND
108	66 kV Gondal-1 (Vachhara road)	Rajkot	Gondal	ND
109	66 kV Gokhlana-II	Rajkot	Jasdan	ND
110	66 kV Kharachiya (Jam)	Rajkot	Jasdan	ND
111	66 kV Barvala (Jasdan)	Rajkot	Jasdan	ND
112	66 kV Kagvad	Rajkot	Jetpur	ND
113	66 kV Ravki	Rajkot	Lodhika	ND
114	66 kV Lodhida	Rajkot	Rajkot	ND
115	66 kV Hadmatiya (Golida)	Rajkot	Rajkot	ND
116	66 kV Beraja (Baradi)	Devbhumi dwarka	Khambhaliya	Coastal
117	66 kV Chela	Jamnagar	Jamnagar	Coastal
118	66 kV Dhichada	Jamnagar	Jamnagar	Coastal
119	66 kV Dhutarpar	Jamnagar	Jamnagar	Coastal
120	66 kV Khodiyar (GIDC PH-II)	Jamnagar	Jamnagar	ND
121	66 kV Chikuwadi (Gordhanpar) (Ravalsar)	Jamnagar	Jamnagar	Coastal
122	66 kV Nana vadala	Jamnagar	Kalavad	ND
123	66 kV Jamvali	Jamnagar	Kalavad	ND
124	66 kV Motibanugar (Rampar)	Jamnagar	Jamnagar Rular	Coastal
125	66 kV Luvari Moli	Gir somnath	Gir Gadhada	ND
126	66 kV Zud Vadli (Khapat)	Gir somnath	Gir Gadhada	ND
127	66 kV Delwada	Gir somnath	Una	Coastal
128	66 kV Bhanduri	Junagadh	Maliya Hatina	Coastal
129	66 kV Chandvana	Junagadh	Mangrol	Coastal
130	66 kV Dungari	Junagadh	Vanthali	ND



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131	66 kV Thanapipli (Nagadiya)	Junagadh		ND
132	66 kV Baloch (Kotda) (Helabeli)	Porbandar	Kutiyana	ND
133	66 kV Pashvari (Kasabad)	Porbandar		ND
134	66 kV Jambu (Thoyana)	Porbandar	Ranavav	ND
135	66 kV Dholidhar (Rangpar)	Rajkot	Jamkandorna	ND
136	66 kV Panch Pipla (Kerali)	Rajkot	Jetpur	ND
137	66 kV Bhankh	Rajkot	Upleta	ND
138	66 kV Alau (Panvi)	Botad	Ranpur	ND
139	66 kV Miyani (Halvad)	Morbi	Halvad	ND
140	66 kV Wadhavan GIDC Rajpar (Mulchand)	Surendranagar	Vadhvan	ND
141	66 kV Pipaliya (Dhora) (Monpar)	Surendranagar	Chotila	ND
142	66 kV Bhechada	Surendranagar	Dhrangadhra	ND
143	66 kV Ramgadh	Surendranagar	Dhrangadhra	ND



Annexure-2: Present Infrastructure of ISTS network

2.1 Transformation Capacity of CTU Network as on 31.03.2021

Sr. No.	Name of Substation	Voltage ratio	Transformation Capacity in MVA
1	765 kV Vadodara (PG)	765/400	3000
2	765 kV Bhujpool (PG)	765/400	3000
3	765 kV Banaskantha (PG)	765/400	3000
4	400 kV Navsari (PG)	400/220	1130
5	400 kV Vapi (PG)	400/220	945
6	400 kV Pirana (PG)	400/220	630
7	400 kV Bhachau (PG)	400/220	630
8	400 kV Dehgam (PG)	400/220	630
9	765 kV Vadodaraz (PG)	400/220	1000
10	765 kV Bhujpool (PG)	400/220	1500
11	765 kV Radhanesda Banaskantha (PG)	400/220	1000
Total...			16465

2.2 Inter-State Transmission Lines as on 31.03.2021:

Sr No	Name of Transmission Line	Line length (CKm)
1	765 kV S/C Vadodara (PG) - Indore	321
2	765 kV S/C Vadodara (PG) - Dhule	268
3	765 kV D/C Banaskantha - Chittorgarh line	604
4	400 kV S/C Vapi (PG) - Boisar line	91
5	400 kV S/C Zerda - Kankroli line	234
6	400 kV S/C Zerda - Bhinmal line	143
7	400 kV D/C SSP - Rajgarh line	472
8	400 kV D/C SSP - Dhule line	344
9	400 kV 2 X S/C Asoj - Indore line	582
10	400 kV D/C Dehgam (PG) - Nagda line	630
11	400 kV D/C Kasor - Rajgarh line	486
12	400 kV D/C Vapi (PG) - Kala (PG) line	101
13	400 kV S/C Magarwada (PG) - Boisar line	106
14	220 kV D/C Navsari - Nasik line	342
15	220 kV S/C Bhilad - Tarapur line	62
16	220 kV S/C Vapi - Tarapur line	117
Total...		4903

2.2.1 HVDC Transmission lines as on 31.03.2021

Sr. No	Name of Transmission Line	Line Length (CKm)
1	±500 KV Mundra - Mohindergadh line (Bipole)	2 X 989



2.3 CTU Transmission Lines within Gujarat state as on 31.03.2021:

Sr.No	Name of Transmission Line	Line Length (CKm)
1	765 kV D/C Bhujpool - Banaskantha line	578
2	400 kV D/C Jhanor - Dehgam line	450
3	400 kV S/C Jhanor - Navsari (PG) line	106
4	400 kV S/C Jhanor - Sugan line	60
5	400 kV S/C Jhanor - GPEC line	13
6	400 kV S/C Sugan - Vapi (PG) line	130
7	400 kV D/C Magarwada (PG) - Navsari (PG) line	252
9	400 kV S/C Pirana (PG) - Dehgam line	112
10	400 kV D/C Mundra UMPP - Bhachau line 1	100
11	400 kV D/C Mundra UMPP - Bhachau line 2	122
12	400 kV D/C Bhachau - Vadavi line	564
13	400 kV S/C Bhachau - Chorania line	220
14	400 kV S/C Bhachau - Mansar - Chorania line	223
15	400 kV D/C Mundra UMPP-Jetpur line	672
16	400 kV D/C Chorania - Vadavi	206
17	400 kV D/C Vadavi - Zerda line	280
18	400 kV D/C Vadodara (PG) - Pirana (PG) line	264
19	400 kV D/C Asoj - Vadodara (PG) line	26
20	400 kV D/C Bhachau (PG) - Varsana line	20
21	400 kV D/C DGEN - Navsari (PG)*	210
23	400 kV S/C Jhanor - Vav line	106
24	400 kV S/C Navsari (PG) - Vav line	16
25	220 kV D/C Jhanor - Haldarwa line	26
26	220 kV D/C Kawas - Haldarwa line	170
27	220 kV D/C Kawas - Vav line	78
27	220 kV D/C Kawas - Icchapore line	6
28	220 kV D/C Kakrapar - Vav line	86
29	220 kV D/C Kakrapar - Haldarwa line	148
30	220 kV D/C Kakrapar - Vapi line	234
31	220 kV D/C Kawas - Navsari (PG) line	60
32	220 kV D/C Navsari - Navsari (PG) line	30
33	400 kV D/C Kakrapar - Navsari line	77
34	400 kV D/C Kakrapar - Vapi line	234
35	400 kV D/C Banaskantha - Sankhari (Veloda) line	44
36	400 kV D/C CGPL - Bhujpool line	196
37	400 kV S/C Pirana (PG) - Nikol line	45
38	400 kV S/C Nikol - Dehgam line	25
Commissioned during 2020-21		
39	400 kV D/C Banaskantha (PS) - Banaskantha PG line	132
Total		6618

Note (*) Dedicated line associated with DGEN project



Annexure-3: Present Infrastructure of Torrent Power network

(Source: Torrent)

3.1 Transformation Capacity of M/s Torrent Power Network as on 31.03.2021:

Sr. No.	Name of Substation	Voltage ratio	Transformation Capacity in MVA
TPL, Ahmedabad			
1	400 kV Nicol-2	400/220/132	1405
2	400 kV Pirana-2	400/132	1335
3	220 kV Odhav	220/132/11	945
4	132 kV Naroda	132/11	270
5	132 kV Amraiwadi	132/11	195
6	132 kV Jamalpur	132/11	195
7	132 kV Naranpura	132/11	310
8	132 kV Nicol-1	132/66	225
9	132 kV Vinzol	132/11	310
10	132 kV Vasna	132/11	270
11	132 kV Dudheshwar	132/11	250
12	132 kV Thaltej	132/11	270
13	132 kV Isro	132/11	270
14	132 kV Prahladnagar	132/11	160
15	132 kV Airport	132/11	110
16	132 kV Vastral	132/11	215
17	132 kV Gandhinagar	132/11	120
18	132 kV IT Park	132/11	120
19	132 kV Pirana	132/11	220
20	132 kV SBI-D	132/11	82.5
TPL, Surat			
21	220 kV Bhatar	220/66	320
22	220 kV Puna	220/66	320
23	220 kV FGIS	220/66	480
24	220 kV CGIS	220/66	320
TPL, Dahej			
25	220 kV DGEN	200/33	150
Total...			8867.5

3.2 Reactive Power Compensation

Sr. No.	Voltage Class	Population of Capacitors (MVAR)	Population of Reactors (MVAR)
1	132 kV	--	100
2	66 kV	254	--
Total...		254	100



3.4 Planned Network of M/s Torrent Power up to 2023:

Voltage Class	Year wise No. of SS			Total
	As on 31.03.2021	2021-22	2022-23	
400 kV	2	--	--	2
220 kV	6	2	1	9
132 kV	17	1	--	18
Total	25	3	1	29

Sr. No.	Name of Sub Station (District)	Name of Associated Transmission elements	Line Length (CKm)
[2021-22]			
1	220 kV Gandhinagar (Gandhinagar City)	220 kV D/C LILO of Gandhinagar TPS to Soja S/S	5
2	220 kV Thaltej SS (Ahmedabad City)	220 kV D/C Line + UG Cable from GETCO Charal SS	36
3	132 kV Lambha SS (Ahmedabad City)	132 kV NP-Vinzol LILO + UG Cable	2
[2022-23]			
4	220 kV Acher SS (Ahmedabad City)	220 kV D/C Line from GETCO Ranasan SS	10



Annexure-4: Wind farms commissioned in the State of Gujarat upto March-2021

(Source: SLDC)

Sr. No.	Wind Farm Owner	WF Village	Name of Substation	District	Approved Capacity (MW)	Installed Capacity (MW)	Associated EHV Substation
1	GEDA	Patelka	66 kV Kalyanpur	Dev bhumi dwarka	14	14	132 kV Bhatia
2	Suzlon	Ukhrala	66 kV Mamsa	Bhavnagar	13	13	220 kV Vartej
3	GEDA	Mervadar	220 kV Sardargadh	Junagadh	21	9	220 kV Sardargadh
4	WWIL	Bamansa	132 kV Bhatia	Dev bhumi dwarka	182	180	132 kV Bhatia
5	GEDA	Navadra	132 kV Bhatia	Dev bhumi dwarka	25	21	132 kV Bhatia
6	GEDA	Bhogat	132 kV Bhatia	Dev bhumi dwarka	25	19	132 kV Bhatia
7	GEDA	Lamba + Gandhvi	132 kV Bhatia	Dev bhumi dwarka	50	40	132 kV Bhatia
8	GEDA	Dhank	66 kV Tanasava	Junagadh	20	13	220 kV Sardargadh
9	Suzlon	Changadi	66 kV Bayath	Kutchh	25	25	220 kV Nanikhakhar
10	Suzlon	Jangi	66 kV Samakhiali	Kutchh	107	107	132 kV Samakhiali
11	Suzlon	Sanodar	66 kV Tansa	Bhavnagar	10	9	220 kV Sagapara
12	Suzlon	Suthari	220 kV Nanikhakhar	Kutchh	290	289	220 kV Nanikhakhar
13	Suzlon	Sindholi	220 kV Nanikhakhar	Kutchh	313	313	220 kV Nanikhakhar
14	WWIL	Sadodar	220 kV Motipaneli	Junagadh	465	462	220 kV Motipaneli
15	Suzlon	Vanku	66 kV Kothara	Kutchh	50	50	220 kV Nakhatrana
16	Vestas	Shikarpur	132 kV Samakhiali	Kutchh	90	90	132 kV Samakhiali
17	Suzlon	Layza	66 kV Don	Kutchh	38	38	220 kV Nanikhakhar
18	Suzlon	Bitavaladiya	66 kV Khedoi	Kutchh	48	48	220 kV Anjar
19	Suzlon	Shikarpur	66 kV Shivilakha	Kutchh	58	56	220 kV Shivilakha
20	RRB Energy	Chandrodi	66 kV Shivilakha	Kutchh	76	75	220 kV Shivilakha
21	Veer Energy	Chandrodi	66 kV Shivilakha	Kutchh	60	58	220 kV Shivilakha
22	Suzlon	Kuchadi	66 kV Bokhira	Porbandar	30	30	220 kV Ranavav
23	Elecon	Mota Gunda	66 kV MotaGunda	Jamnagar	39	38	132 kV Bhomiyavadar
24	Shriram EPC	Kotdapitha	66 kV Kotda Pitha	Amreli	40	25	132 kV Jasdan
25	Vestas	Vandhiya	220 kV Shivilakha	Kutchh	200	200	220 kV Shivilakha



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26	Suzlon	Varsemedi	132 kV Wankaner	Rajkot	120	120	132 kV Wankaner
27	Elecon	Baradiya	66 kV Varvala	Jamnagar	25	21	132 kV Bhatia
28	WWIL	Tebhada	220 kV Nyara (Rajkot)	Jamnagar	450	368	220 kV Nyara
29	Suzlon	Gorser	66 kV Madhavpur	Porbandar	26	26	220 kV Keshod
30	GFL	Golida	66 kV Jasdan-II (Gadhadiya)	S'Nagar	26	26	132 kV Jasdan
31	GFL	Golida	132 kV Jasdan	Rajkot	70	70	132 kV Jasdan
32	Suzlon	Jodiya, Balambha	66 kV Latipar	Jamnagar	33	33	132 kV Dhrol
33	Suzlon	Adodar	66 kV Chhayatown	Porbandar	38	38	220 kV Ranavav
34	Suzlon	Halenda	66 kV Mota Dadva	Rajkot	40	40	132 kV Jasdan
35	Suzlon	Jamanwada	220 kV Varsana	Kutchh	305	305	400 kV Varsana
36	WWIL	Rasaliya	66 kV Nakhatrana	Kutchh	67	66	220 kV Nakhatrana
37	Suzlon	Parevada	66 kV Kamlapur	Rajkot	25	25	132 kV Jasdan
38	Azalea	Tithwa	66 kV Jadeshwar	Rajkot	30	30	132 kV Wankaner
39	Betam	Tithwa	66 kV Jadeshwar	Rajkot	30	30	132 kV Wankaner
40	Suzlon	Bhojapuri	66 kV Rajpara	Rajkot	70	50	132 kV Wankaner
41	Elecon	Vasai	66 kV Varvala	Jamnagar	35	31	132 kV Bhatia
42	Elecon	Vinjalpur	66 kV Bhadthar	Jamnagar	35	21	132 kV Bhatia
43	Suzlon	Mota Gunda	132 kV Bhomiyavadar	Junagadh	120	120	132 kV Bhomiyavadar
44	PWPL	Nani Matli	66 kV Modpar	Jamnagar	25	25	220 kV Jamnagar
45	Suzlon	Charanka	66 kV Charanka	Patan	4	4	400 kV Charanka
46	WWIL	Vadali	66 kV Vichhya	Rajkot	70	65	132 kV Paliyad
47	Suzlon	Rajapara, Kotda	66 kV Hadamtala	Rajkot	70	65	220 kV Gondal
48	Sitec RE	Raipar	66 kV Rojmal	Amreli	36	22	132 kV Paliyad
49	K P Energy	Baradia	66 kV Visavada	Porbandar	34	34	220 kV Ranavav
50	Kintech Synergy	Amarapur	220 kV Tharad	B'kantha	300	204	220 kV Tharad
51	Powerica	Kobalavadar	66 kV Goinj	Jamnagar	70	70	132 kV Khambhalia
52	Inox	Sukhpur	400 kV Amreli	Amreli	460	460	400 kV Amreli
53	K P Energy	Shedivadar	66 kV Kadamgiri	Bhavnagar	40	34	220 kV Sagapara
54	PWPL	Dhorasiya	66 kV Dhudasiya	Jamnagar	60	31	220 kV Jamnagar
55	Regen	Vejalpur	66 kV Vejalpur	Morbi	50	42	220 kV Morbi



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56	Sitec RE	Kalorana	132 kV Jasdan	Rajkot	100	100	132 kV Jasdan
57	Suzlon	Ukheda	400 kV Varsana	Kutch	250	218	400 kV Varsana
58	Sitec RE	Ratabhe	66 kV Dungarpur	Surendranagar	36	26	220 kV Morbi
59	K P Energy	Degam	66 kV Bakhrala	Porbandar	70	69	220 kV Ranavav
60	Sitec RE	Nani Kundal	66 kV Kothdapitha	Amreli	40	26	132 kV Jasdan
61	Sitec RE	Galla	66 kV Pipartoda	Jamnagar	36	26	220 kV Jamnagar
62	Gamesa	Maliya	66 kV Jetpar	Morbi	50	40	220 kV Morbi
63	WWIL	Parabadi	220 kV Botad	Botad	300	70	220 kV Botad
64	Suzlon	Kandorna	66 kV Babarzar	Jamnagar	50	44	220 kV Jamnagar
65	Sri Maruti	Sadla	220 kV Sadla	Surendranagar	350	146	220 kV Sadla
66	Inox	Chhapri	66 kV Vijpadi	Amreli	35	24	220 kV Savarkundla
67	Inox	Vanda	66 kV Vanda	Amreli	35	34	220 kV Savarkundla
68	Suzlon	Khiri	66 kV Khiri	Jamnagar	70	63	132 kV Dhrol
69	Veer Energy	Khundra	66 kV Thadach	Amreli	30	27	220 kV Sagapara
70	Suzlon	Jodiya-2(Banogar)	66 kV Moti Banogar	Jamnagar	40	38	220 kV Jamnagar
71	Jai Ambe	Jambarva	66 kV Jambarvada	Amreli	50	34	132 kV Paliyad
72	K P Energy	Vagnagar	66 kV Vadali	Bhavnagar	70	55	220 kV Otha
73	Suzlon	Hotji Khabda	66 kV Kotda Bavishi	Jamnagar	70	53	220 kV Motipaneli
74	Powerica	Bhatel	66 kV Khambhaliya	Jamnagar	51	51	132 kV Khambhaliya
75	Adani	Mundra	220 kV APL line	Kutch	12	12	220 kV MUPL bus
76	Sri Maruti	Virvav	220 kV Hadala	Morbi	350	126	400 kV Hadala
77	Sprng Alt Energy	Patan	220 kV Moti Paneli	Jamnagar	200	198	220 kV Motipaneli
78	Gala Energy	Keshiya	132 kV Dhrol	Jamnagar	63	63	132 kV Dhrol
79	Gala Energy	Taranna	66 kV Jam dudhai	Jamnagar	42	42	132 kV Dhrol
80	Renew	Kolithad	220 kV Gondal	Rajkot	51	35	220 kV Gondal
81	Powerica	Umradi	66 kV Rabarika	Rajkot	51	51	400 kV Jetpur
82	Vena Energy	Balel Pipaliya	66 kV Lunidhar	Amreli	29	20	400 kV Amreli
83	Vena Energy	Miya Khijadiya	66 kV Kuvargadh	Amreli	40	18	400 kV Amreli
84	GNESL	Ghelda	66 kV Ghunada	Jamnagar	30	22	220 kV MotiGop
Total					7653	6425	



Annexure-5: Solar Plants commissioned in the State of Gujarat upto March 2021

Sr. No.	Solar Generating Plants	Installed Capacity (MW)*
1	Solar Generation plants across the State	2174
2	Solar Generation plants under Charanka Solar Park	848
3	Solar Generation plants connected at 11 kV level	244
Total		3266
Roof Top Solar Capacity		1005

Note: (*) The above installed solar capacity is DC solar capacity.

(source: SLDC)

Sr. No.	Developer	Location	District	MW	GETCO Substation	Connected EHV substation
1	Sunkone	Ghaspur, Ta. Jafrabad	Amreli	10	66 kV Mota Barman	220 kV Savarkundla
2	ACME	Vadgam, Ta. Khambhat	Anand	15	132 kV Undel	132 kV Undel
3	Enersan Power Private Ltd. (SECI/JNSSM)	Shivlakha, Ta. Bhachau	Kutch	10	220 kV Shivlakha	220 kV Shivlakha
4	Sand Land	Alwada, Ta. Dhanera	B.K	25	66 kV Khimmat	400 kV Zerda
5	Rallis India Ltd	Dahej Ta. Bharuch	Bharuch	4	66 kV Dahej	220 kV Dahej
6	TATA Power	Mithapur, Ta. Dwarka	Jamnagar	25	66 kV Varvala	132 kV Bhatia
7	Mono Steel	Kesariya, Ta. Una	Junagadh	10	66 kV Kesharia	220 kV Dhokadava
8	Adani Power	Bitra, Ta. Abdasa	Kutch	40	66 kV Netra	220 kV Bhachunda
9	Backbone	Shivlakha, Ta. Bhachau	Kutch	5	220 kV Shivlakha	220 kV Shivlakha
10	Backbone (SECI / JNSSM)	Shivlakha, Ta. Bhachau	Kutch	10	220 kV Shivlakha	220 kV Shivlakha
11	Euro Solar Private Ltd	Shivlakha, Ta. Bhachau	Kutch	5	220 kV Shivlakha	220 kV Shivlakha
12	GMDC	NaniChher, Ta. Lakhpatri	Kutch	5	66 kV GMDC	-
13	Integrated Coal ind	Pratapghad, Ta. Bhachau	Kutch	9	220 kV Shivlakha	220 kV Shivlakha
14	Konark	Shivlakha, Ta. Bhachau	Kutch	5	220 kV Shivlakha	220 kV Shivlakha
15	Solar Semiconductor	Chitrod, Ta. Bhachau	Kutch	20	220 kV Shivlakha	220 kV Shivlakha
16	Sunborne	Karmariya, Ta. Bhachau	Kutch	15	66 kV Shikra	220 kV Vondh
17	Texas	Kanyabe, Ta. Bhuj	Kutch	5	66 kV Kanaiyabe	220 kV Tappar



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18	Unity Power	Khirsara, Ta.Anjar	Kutch	5	66 kV Dudhai	220 kV Tappar
19	Welspun	Khirsara, Ta.Anjar	Kutch	15	66 kV Dudhai	220 kV Tappar
20	Astonfield Solar (Gujarat)	Nayka, Ta. Sami	Patan	12	66 kV Bhadrada	220 kV Radhanpur
21	Jaihind Projects	Chandiyana, Ta. Sami	Patan	5	66 kV Bhadrada	220 kV Radhanpur
22	Lanco Infratech	Bhadrada/ Chandiyana, Ta.Sami	Patan	20	66 kV Bhadrada	220 kV Radhanpur
23	PLG photovoltaic	Dahisar, Ta. Varahi	Patan	20	66 kV Dahisar	220 kV Radhanpur
24	Precious Energy	Gunthawada, Ta.Harij	Patan	15	66 kV Dunawada	220 kV Sankhari
25	Solitaire Energy	Gunthawada, Ta.Harij	Patan	15	66 kV Aganwada	220 kV Sankhari
26	APCA Power	Khageshri, Ta.Kutiya	Porbandar	5	66 kV Paravada	220 kV Sardargadh
27	GHI Energy	Helabeli, Ta.Kutiya	Porbandar	10	66 kV Khageshri	220 kV Sardargadh
28	Hiraco	Bapodar, Ta. Kutiya	Porbandar	20	66 kV Rana Kandonna	220 kV Ranavav
29	Moserbaer	Kerala, Ta.Kutiya	Porbandar	15	66 kV Rana Kandonna	220 kV Ranavav
30	Aravali Infra power	Dhak, Ta.Upleta	Rajkot	5	66 kV Tanaswa	220 kV Sardargadh
31	CBC Solar	Mervadar, Ta.Upleta	Rajkot	10	66 kV Mervadar	220 kV Sardargadh
32	Ganeshvani Merchandise	Mervadar, Ta.Upleta	Rajkot	5	66 kV Mervadar	220 kV Sardargadh
33	Ganges Green Energy	Mervadar, Ta.Upleta	Rajkot	25	66 kV Mervadar	220 kV Sardargadh
34	Green Infra solar	Mervadar, Ta.Upleta	Rajkot	10	66 kV Tanaswa	220 kV Sardargadh
35	Jaydeep Cotton Fibers Pvt. Ltd.	Rajkot	Rajkot	6	66 kV Kudava	132 kV Wankaner
36	Aatash Power	Sirdi Sarkhandi, Ta.Dhans.	S.K.	5	66 kV Gabat	220 kV Dhansura
37	Azure (Haryana)	Khadoda, Ta.Dhansura	S.K.	10	66 kV Bayal	220 kV Dhansura
38	Azure (Gujarat)	Dhama, Ta. Patdi	S'nagar	5	66 kV Dhama	220 kV Viramgam
39	Chattel Construction	Zainabad, Ta.Patdi	S'nagar	25	66 kV Patdi	220 kV Viramgam
40	Driesatz My Solar	Fatepura, Ta.Patdi	S'nagar	15	66 kV Patdi	220 kV Viramgam
41	EMCO Power	Fatepura, Ta.Patdi	S'nagar	5	66 kV Patdi	220 kV Viramgam
42	ESP Urja	Dhama, Ta. Patdi	S'nagar	5	66 kV Patdi	220 kV Viramgam
43	Louroux Ltd.	Dhedhuki, Ta.Sayla	S'nagar	25	66 kV Kuntalpur	220 kV Sadla
44	Mi My Solar	Fatepura,	S'nagar	15	66 kV Dhama	220 kV Viramgam



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		Ta.Patdi				
45	Milennium	Dhama, Ta. Patdi	S'nagar	9	66 kV Dhama	220 kV Viramgam
46	Responsive Sutip	Kamalpur, Ta.Patdi	S'nagar	25	66 kV Kamalpur	220 kV Viramgam
47	S J Green Park Energy	Tikar, Ta.Muli	S'nagar	5	66 kV Muli	220 kV Sadla
48	Ujjawala Power	Kamalpur, Ta.Patdi	S'nagar	23	66 kV Kamalpur	220 kV Viramgam
49	Visual Percept	Surel, Ta.Dasada	S'nagar	25	66 kV Dhama	220 kV Viramgam
50	WAA Solar	Tiker, Ta. Muli	S'nagar	10	66 kV Sadla	220 kV Sadla
51	GIPCL	NaniNaroli, Ta.Mangrol	Surat	5	66 kV Mosali	220 kV Kim
52	Torrent Solargen Ltd.	Kim. Ta. Olpad	Surat	87	220 kV Kim	220 kV Kim
53	Sardar Sarovar Narmada Nigam Limited (Canal Top)	Vadodara	Vadodara	10	66 kV Sama	220 kV Gotri
54	Sardar Sarovar Narmada Nigam Limited (Canal Bank & Top)	Vadodara	Vadodara	26	66 kV Vyankatpura	220 kV Vyankarpura
55	Indian Oil Corporation Ltd.	Sanand	Ahmedabad	8	66 kV Madhavnagar	220 kV Viramgam
56	Jay Chemical Industries Ltd. (66 kV)	Kalamsar	Anand	4	-	-
57	Madhu Silica Pvt. Ltd.	Vartej	Bhavnagar	25	66 kV Motidharai	220 kV Vallabhipur
58	Azure Power Thirty Three Pvt. Ltd.	Gabat	Aravali	30	66 kV Gabat	220 kV Dhansura
59	Azure Power Thirty Three Pvt. Ltd.	Malitadi	Kheda	40	66 kV Malitadi	220 kV Kapadwanj
60	Azure Power Thirty Three Pvt. Ltd.	Vartol	S.K	28	66 kV Vartol	220 kV Bhutiya
61	Azure Power Thirty Three Pvt. Ltd.	Chidra	Bharuch	35	66 kV Chidra	220 kV Gavasad
62	Aditya Birla Renewables SPV1	-	Kutch	5	-	-
63	Gujarat State Electricity Corporation Ltd. (GSECL)	Dhuvaran	Anand	76	220 kV Dhuvaran	220 kV Dhuvaran
64	GRT Jewellers (India) Pvt. Ltd.	Bavli	S'nagar	30	66 kV Bavli	220 kV Dhrangadhra
65	GRT Jewellers (India) Pvt. Ltd.	Harij	Patan	30	66 kV Harij	220 kV Sankhari
66	Azure Power Thirty Three Pvt. Ltd.	Shinavad	Aravali	60	66 kV Shinavada (Muloj)	220 kV Faredi
67	Azure Power Thirty Three Pvt. Ltd.	Netramali	S.K	60	66 kV Netramali	132 kV Idar



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68	GRT Jewellers (India) Pvt. Ltd.	Digsar	S'nagar	39	66 kV Digsar	220 kV Sadla
69	Azure Power Thirty Three Pvt. Ltd.	Sanesh	Bhavnagar	75	66 kV Sanesh	220 kV Vallabhipur
70	ONGC	Bharuch	Bharuch	6	66 kV Wagra	220 kV Wagra
71	KPI Global Infrastructure Ltd.	Sudi	Bharuch	27	220 kV Amod	220 kV Amod
72	Aditya Birla Renewables SPV1 Ltd.	Jaloya	Banaskantha	52	66 kV Jaloya	220 kV Tharad
73	Aditya Birla Renewables Ltd.	Pipardi	Bhavnagar	42	66 kV Bhandariya	220 kV Gariyadhar
74	Aditya Birla Ltd	Talsana	Surendranagar	50	66 kV Rojasar	220 kV Viramgam
75	Juniper Green Sigma pvt ltd	Bilvaniya	Himatnagar	66	66 kV Khadol	220 kV Dhansura
76	Juniper Green Sigma pvt ltd	Bhordu	Palanpur	58	66 kV Bhoradu	220 kV Tharad
77	Juniper Green Sigma pvt ltd	Babsar	Himatnagar	51	66 kV Babsar	220 kV Bhutiya
78	Gaya Solar Bihar Pvt Ltd (Adani)	Khirasara	Anjar	225	400 kV Varsana	400 kV Varsana
79	Gaya Solar Bihar Pvt Ltd (Adani)	Khirasara	Anjar	141	400 kV Varsana	400 kV Varsana
80	Avaada Sunrise / Giriraj Renewable	Talsana	Surendranagar	78	400 kV Chorania	400 kV Chorania
81	GSECL (approved capacity 75 MW)	Dhuvaran	Anand	60	220 kV Dhuvaran	220 kV Dhuvaran
Total				2174		

5.4.2 Solar Generation plants under Charanka Solar Park

Charanka Solar Park Connectivity (400 kV Charanka Substation)	(1) 400/220 kV, 2 x 315 MVA ICTs (2) 400 kV D/C Charanka - Veloda (Sankhari) line (3) 400 kV S/C Varsana - Charanka line (4) 400 kV S/C APL Mundra - Charanka line (5) 400 kV D/C Charanka - Zerda line (6) 220/66 kV, 8 X 100MVA (7) 220 kV D/C Charanka - Jangral line (8) 66 kV Charanka - Radhanpur line
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(source: SLDC)

Sr No.	Developer	Connected Substation	District	Capacity (in MW)
1	AES Solar	220 kV Charanka	Patan	15
2	Avtar Solar	220 kV Charanka	Patan	5
3	Emami	220 kV Charanka	Patan	10
4	GMR Solar	220 kV Charanka	Patan	25
5	GPCL	220 kV Charanka	Patan	5

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6	GPCL (SECI/JNSSM)	220 kV Charanka	Patan	10
7	GPPC	220 kV Charanka	Patan	5
8	GSECL, (SECI/JNSSM)	220 kV Charanka	Patan	10
9	Inspira (Palace)	220 kV Charanka	Patan	15
10	Kindle Engineering & Construction Pvt. Ltd.	220 kV Charanka	Patan	50
11	Lanco Infratech	220 kV Charanka	Patan	35
12	NKG Infra	220 kV Charanka	Patan	10
13	Roha dyechem	220 kV Charanka	Patan	25
14	SEI Solar Power Gujarat Pvt. Ltd.	220 kV Charanka	Patan	25
15	Solar Field (Kiran)	220 kV Charanka	Patan	20
16	Sun Clean	220 kV Charanka	Patan	6
17	Surana	220 kV Charanka	Patan	5
18	Torrent Solargen Ltd.	220 kV Charanka	Patan	51
19	Yantra eSolar	220 kV Charanka	Patan	5
20	ZF steering	220 kV Charanka	Patan	5
21	Alex Astral	220 kV Charanka	Patan	25
22	SJVN	220 kV Charanka	Patan	5
23	Astra Solaren Pvt Ltd.	220 kV Charanka	Patan	52
24	Renew Solar Energy Pvt. Ltd.	220 kV Charanka	Patan	48
25	Astral Solaren Pvt Ltd.	220 kV Charanka	Patan	33
26	Orange Charnka Solar Energy Pvt. Ltd.	220 kV Charanka	Patan	53
27	GIPCL Plot 1	220 kV Charanka	Patan	47
28	TATA Power Renewable Energy Ltd.	220 kV Charanka	Patan	32
29	GIPCL Plot 3	220 kV Charanka	Patan	47
30	Gujarat Alkalies and Chemicals Ltd.	220 kV Charanka	Patan	17
31	GIPCL	220 kV Charanka	Patan	71
33	Gujarat State Fertilisers & Chemical Ltd.	220 kV Charanka	Patan	13
35	GIPCL	220 kV Charanka	Patan	26
36	Gujarat Alkalies and Chemicals Ltd.	220 kV Charanka	Patan	24
37	PLG Photovoltaic	220 kV Charanka	Patan	20
Total				848



Annexure-6: Adoption of New Technology in GETCO

In transmission, GETCO objectives are not limited to system availability, grid reliability, transmission network capacity addition with minimum transmission losses, but simultaneously implement cost effective, safe and efficient & sustainable integrated smart grid solutions. GETCO, being a State Transmission Utility (STU), has done the mapping of all technical and business functions and identified many Smart Grid solutions.

6.3.1 New Technologies already implemented

Smart Grid technologies adopted	Purpose	Status
Substation Automation System	Remote Control Operation: One or more substations are centrally operated from nearby substation which works as a master remote control centre.	SAS installed at 53 Nos. of substations. Out of them, 34 substations are operated from Remote Control Centre (Adjacent substations)
Digital Substation	A step towards better reliability and speed. Inputs for protection control, monitoring and measurements are captured in digits through optical sensors. There will be no hard copper wire cabling in switchyard.	Four pilot projects completed at Jambuva, Asoj, Lunawada and Modasa Based on above experiences, Construction of Fully Digital substation is under process at 220 kV Sevaliya substation.
Integrated Asset Management System	Centrally Managed Monitoring System through INTRANET	Transmission Asset Management System (TAMS) in operation
GIS and Hybrid switchgear	Suitable for Hostile & Polluted Environment Especially in Urban Areas where there is Scarcity or high cost of Land. Maintenance free and economical on life cycle cost basis	5 Nos of 220 kV, 1 Nos of 132 kV & 1 Nos of 66 kV Substations are with Hybrid Switchgear. 5 Nos of 66 kV, 4 No. of 220 kV and 4 No. of 400 kV GIS substations are in service.
High Capacity Conductor & HTLS conductor	50% more capacity with lesser transmission loss	AL 59 permanently adopted for 220 kV



Smart Grid technologies adopted	Purpose	Status
Power transformer with Ester oil	High flash point to safeguard transformer from catching fire. 30% higher MVA Extension	Successfully Adopted in 66/11 kV Class
Geographic Information System (GIS) Mapping of Transmission Assets	Capturing asset information on geographical map for better asset management and network planning	Entire GETCO network is mapped.
Wind Forecasting & Scheduling	Tools for wind generation forecast which will help in Scheduling of Power	Installed.
Real Time Grid Visualization	Phasor Measurement Units (PMU) and Wide Area Monitoring System (WAMS) 3 Data Analytics Developed Online Power System Oscillation Mode Identification Hybrid State estimator Dynamic security assessment with voltage stability	113 PMUs on 25 Locations
Static Synchronous Compensator (STATCOM)	For dynamic reactive power compensation and improvement in voltage profile	Installed at 220 kV Timbdi substation (Rating: ± 120 MVAR, 220 kV STATCOM)
OPGW	Communication Highway	5507 KM completed, 5795 KM under construction and 7248 Km under Tenderization

6.3.3 Some good practices being followed regularly and consistently:

- STU Cell and Network Review on half yearly basis to account for Real Time operation of grid
- Diagnostic Condition Monitoring of Assets - Skills and expertise to make full justification of investment.
- Hot line washing of substation and lines with in-house designed machine
- Feedback to DISCOMs through Data Acquisition System for feeder outages and power factor.
- Asset Mapping and Annual Review on grid performance - Key system parameters as per ISO objective and target set, network assessment, failure rate, constraints in operation, budget monitoring etc.
- Co-ordination meeting with DISCOMs for their requirement of transmission network to construct what is required

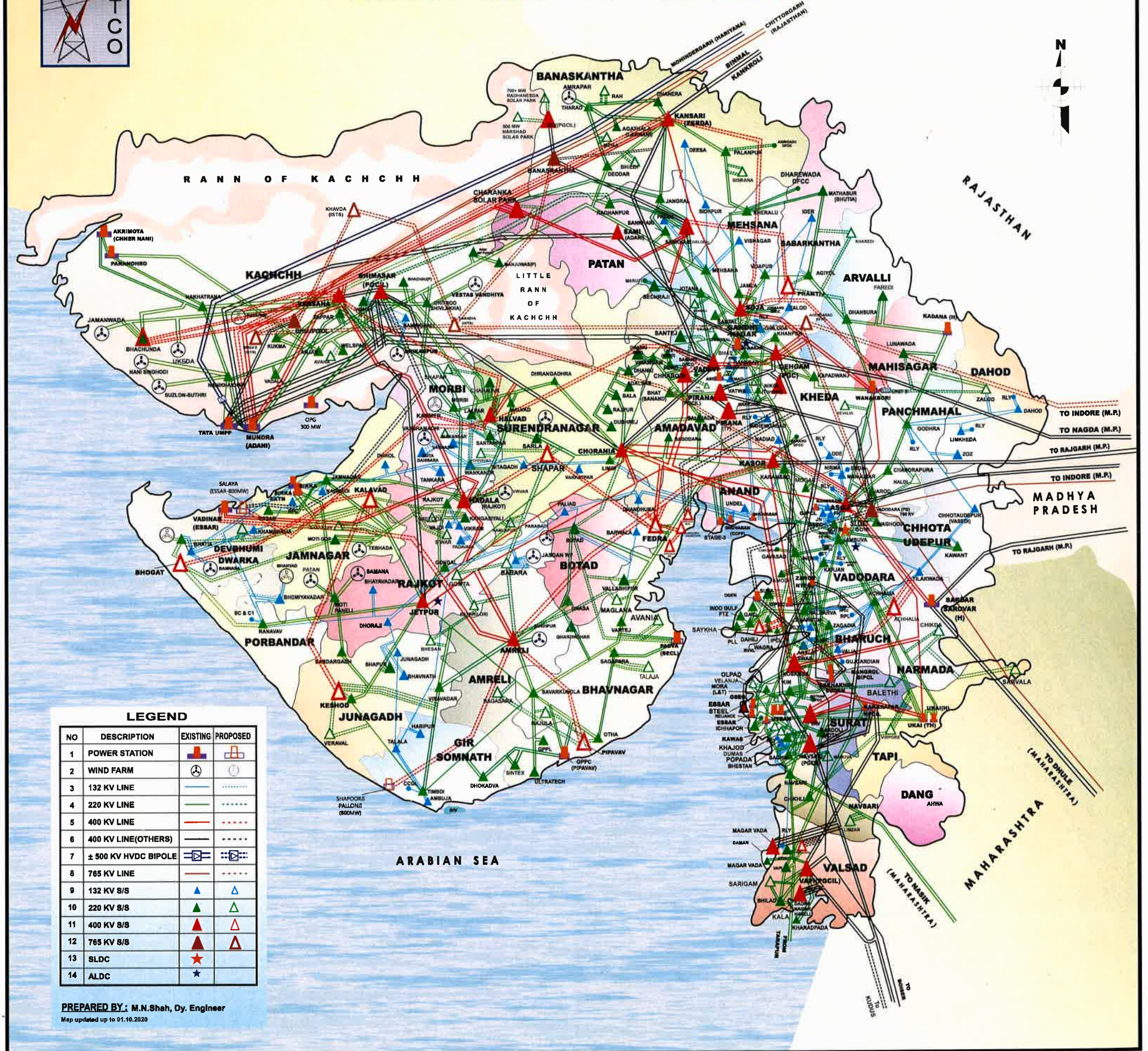


- Smart Grid Road Map and Nodal Officer for implementation
- Land Acquisition Cell to co-ordinate with GoG - Weekly monitored by Hon'ble MoP and his office
- Standardization of design and drawings to save engineering time (We provide full engineering)
- Vendor Development Policy for India and Foreign Bidders.
- Vendors Meet every year to address their issues
- Inventory Management Cell to monitor Store and Inventory policy of GETCO
- R&M Policy to replace obsolete and aged equipments which are not meeting system condition today
- Co-ordination meeting with new EHV consumers for quick connection release and then generate revenue for Discoms
- Education Policy to fund employee for higher education
- Policy to recognize and reward the honorarium for technical papers in National seminar/ Conference/ Workshop
- In-house IT department to conduct all On-line examination in GETCO

Further, for efficient grid operation, GETCO have adopted State of Art Technology such as Load forecasting, Renewable Energy Forecasting, Demand Side Management System and developed various analytics for real time grid operation to impact minimum back down of conventional power stations.



POWER MAP OF GUJARAT



LEGEND			
NO	DESCRIPTION	EXISTING	PROPOSED
1	POWER STATION		
2	WIND FARM		
3	132 KV LINE		
4	220 KV LINE		
5	400 KV LINE		
6	400 KV LINE(OTHERS)		
7	± 500 KV HVDC BIPOLE		
8	765 KV LINE		
9	132 KV S/S		
10	220 KV S/S		
11	400 KV S/S		
12	765 KV S/S		
13	SLDC		
14	ALDC		

PREPARED BY: M.N.Shah, Dy. Engineer
Map updated up to 01.10.2020



Gujarat Energy Transmission Corporation Limited (GETCO)
Sardar Patel Vidhyut Bhavn, Race Course, Vadodara – 390 007
Gujarat, India

Website : www.getcogujarat.com

E-mail : stu.getco@gebmail.com