



GPRD 3i

Year 2021
Volume 2



MoU BETWEEN
i-Hub & GUVNL
Govt. of Gujarat



www.gprd.in

Gujarat Power Research & Development Cell

CONTENTS

GPRD 3i

R & D Team

J B Upadhyay

I/c Head, GPRD Cell &
Executive Engineer (R&D)

D R Shah

I/c Executive Engineer (R&D)

R D Patel

I/c Executive Engineer (R&D)

K N Mandaliya

Manager

J H Borisagar

Deputy Engineer (R&D)

S P Rathod

Junior Engineer (R&D)

H M Sakariya

Junior Engineer (R&D)

J V Patel

Junior Engineer (R&D)

U N Joshi

Junior Engineer (IT)

M A Vhora

Senior Assistant (IT)

K J Solanki

Senior Assistant (R&D)

J B Vadgama

Junior Assistant (IT)

Messages From...

Shri Saurabh Patel, Hon'ble Ministry of Energy, GoG 3

Shri Pradipsinh Jadeja, Hon'ble Ministry of State, Energy GoG 4

Mamta Verma, PS, E&PD, GoG 5

Shahmeena Husain, MD, GUVNL 6

Shri H P Kothari, Director (Tech), GUVNL 7

Shri R B Patel, Former Head, GPRD Cell 8

Move Forward

MoU between i-Hub & GUVNL 9

Outset

GPRD 3i Inauguration 11

Honoured Visitants

Shri Sujit Gulati, IAS 11

Delineate

Research Paper : Remote Metering through LORA WAN 12

Adjudge

Awards 16

Rock Climbing

Text From The Desk Of Editor : Geo Urja 18

Remote Interaction

Webinar 24

Trekking

From Field To National Rostrum 25

Editor

K N Mandaliya

+91 99252 13924

knmandaliya@gprd.in



SHRI SAURABH PATEL

HON'BLE MINISTER OF ENERGY, GOVERNMENT OF GUJARAT



In a historical event, the erstwhile GEB was unbundled in 7 separate entities i.e. GUVNL, GSECL, GETCO and four DISCOMs from 1st April 2005. I congratulate to all the employees and management of the GUVNL and all its subsidiaries for carving the success story in the power sector upfront on the national level by achieving goals and setting benchmarks for the others since last 15 years. It is a matter of pride that after the successful unbundling in Gujarat, the services to the consumers, power reliability, power quality and system efficiency have improved. I must take note here that the proper implementation of innovative concepts in any organization, benefits to not only the organization but also to all its stakeholders.

The Jyoti Gram Yojana (JGY) is also one of the most successful innovative concepts. Gujarat Power sector, by implementing the innovative concept successfully, we have become the first state PAN India in providing of 24x7 Power supply to all the consumers even in deep rural areas, which has put the Gujarat power sector far ahead of the other states. Now we have started the implementation of one more innovative concept of catering day time power to farmers under "Kisan Suryoday Yojana". One more feather will get added to the crown of the Gujarat Power sector.

With the joint efforts of all the employees of GUVNL and all its subsidiaries and implementation of innovative concepts and ideas, the significant transformation took place and the Power Companies of other states have started visiting Gujarat to learn from our advancement, experiments and new developments in Gujarat Power sector.

I am very happy to state here that under the auspices of Gujarat Urja Vikas Nigam Limited, we have made Gujarat proud across India in the field of the Power sector by receiving more than 150 national awards.

The countries, who understood the importance of R&D have left the rest of the world far behind by implementing innovative concepts. Examples are before us that those who have concentrated in research activities and spent time and money are well established their status in the world. Our Hon'ble Prime Minister Shri Narendrabhai Modi is very keen on innovations. If we want to make the Bharat ATMANIRBHAR (selfliance), R&D activities are highly important for our organization, state and country.

I feel proud and congratulate the team of The Gujarat Power Research and Development Cell (GPRD) who has undertaken more than 130 Research Projects in the field of the Power Sector within a very short span of time. I appeal to GUVNL, GSECL, GETCO and all DISCOMs to continue your valuable contribution and support to the GPRD team towards making Gujarat proud across India by furthering your efforts in a more successful manner.

Most importantly, our esteemed customers and other stakeholders must get benefitted through the successful implementation of the innovations. Through the GPRD 3i volume, I request and send greetings that let us continually reach the height of progress, with more successful researches.

With Regards


Saurabh Patel



SHRI PRADIPSINH JADEJA

HON'BLE MINISTER OF STATE, ENERGY, GOVERNMENT OF GUJARAT



It is a matter of pride that Gujarat has been performing exceptionally well in the field of Power Distribution, Generation and Transmission across India since last 15 years. Even after accomplishing these three major activities, we are continually striving towards ensuring uninterrupted reliable and quality Power supply to our valued customers.

I must say that research activities in any of the progressive organizations are a prime requirement. The Innovations and its successful implementation only make the organization sustainable and flourishing. The developed countries are very keen about their R&D activities and spend huge money and manpower with better administrative support and as a result, they are far ahead of the rest of the countries. We know that a strong and efficient power sector is the backbone and key factor to the fast development of any country. Under the strong leadership of Hon'ble Prime Minister Shri Narendrabhai Modi, India is developing very fast. Initiatives taken by the Gujarat Government for the establishment of R&D Cell in the Gujarat power sector will prove to be a boon and support the goal of the development of the country. I would like to associate that Gujarat Power Research and Development (GPRD) Cell is adding new pages in history by exploring innovative researches.

I truly wish that through innovative researches, we will continue to provide the best services of Power supply to our valued customers and we will earn their trust. I also urge you all to keep Gujarat at the forefront in the Power Sector across India.

Congratulations to all the members of the R&D team of GPRD Cell for their efforts for the continual research for reliable, quality and efficient Power supply by ensuring R&D projects.

Gujarat Power Research and Development (GPRD) Cell is continuously carrying out researches and it is an immense pleasure to present it through the volume of GPRD 3i.

I extend my heartfelt congratulations to the editorial team.

With regards

Pradipsinh Jadeja



MAMTA VERMA, IAS
PRINCIPAL SECRETARY, E&P DEPT., GOVERNMENT OF GUJARAT



It is a matter of proud and pleasure having known that the Gujarat Power sector has been working in a very professional way. Gujarat power sector has implemented so many innovative and novel concepts to dedicatedly provide reliable, quality and efficient power supply to its valuable customers. Such innovative concepts like 24x7, 3 phase power supply even in deep rural areas under Jyoti Gram Yojana (JGY), Suryashakti KisanYojana (SKY), Kisan Suryoday Yojana (KSY), Surya Gujarat, Solar Park at Charanka, Small Scale Distributed Solar Power Plan and so on. I congratulate the teamwork and efforts made by all employees of GUVNL and its subsidiaries as all these innovative concepts and their successful implementation have made Gujarat distinct and put far ahead of the power sectors of the other states.

We are devoted to continue and carry out the same efforts to provide uninterrupted, reliable and efficient power supply and services to our valued customers with innovations and their successful implementation.

Having gone through so many GPRD research projects which have been successfully completed and the ongoing projects, I feel that R&D projects are excellent and competent to reform the power sector if implemented sincerely by the DISCOMs.

The R&D activities have boundless scopes and a vision beyond the horizon of innovations and I hope that Gujarat Power Research and Development Cell will continue the innovations and all DISCOMs will sincerely implement the innovations so that Gujarat Power sector be reckoned at the National level.

Congratulations to the team of GPRD Cell, who have made invaluable contributions in the field of R&D, specifically in the Power Sector.

I would like to congratulate all the members of the Editorial Team of GPRD 3i for their successful efforts to deliver this invaluable researches to our esteemed customers.


Mamta Verma, IAS



SHAHMEENA HUSAIN, IAS MANAGING DIRECTOR, GUVNL, VADODARA



Gujarat has been at the forefront of power sector reforms and innovation for many years. It has pioneered landmark schemes and put in place innovative concepts that has brought a paradigm shift in the state's power sector. Today, Gujarat's power sector is seen as a model worth emulating and has inspired many state across India to follow in its footsteps for consumer-oriented schemes and novel practices. Renewable sector too has gained momentum in recent past and has witnessed many first-of-its-kind projects being undertaken in the state. I am personal witness to state's power sectors rise and have observed other states from close quarters as well.

It gives me joy and certainly a proud moment to be associated with state's energy sector. Gujarat is continuously striving to improve customer services & their satisfaction level with multipronged efforts being put in place at distribution, generation and transmission level. Representatives from other states and high level delegations from across India are visiting Gujarat Power Utilities to study innovative schemes and concepts that are successfully implemented.

Having witnessed GPRD Cell's nurturing of new ideas and innovative researches since its inception, I am glad to acknowledge that despite having a very small dedicated team, GPRD Cell has been doing very well in taking up innovative research and its implementation, which will bring have its positive impact on the power sector. We may still strengthen Gujarat power sector for its techno-commercial health with efficient and reliable services to our valuable customers by innovations and implementing them in the right spirit.

Any innovation calls for theoretical know-how, thorough study, experimentations of the subject in focus & deliver practical and problem-solving results. At GPRD Cell, to build a very robust research & result oriented team, GUVNL carried out a stringent selection procedure to recruit a dedicated team of engineers having sound research bent of mind and thorough knowledge of the subjects to give an overall competitive edge to the internal research works.

I will urge MDs of all subsidiaries, departmental heads, engineers, officers and employees to support the GPRD team in innovations and implementation of innovative pilot projects so that we can achieve more and more milestones across the India.

I am congratulate the GPRD team who has taken lead in R&D projects and strives to work towards the innovations to make the power sector more efficient. Also compliment Editorial Team of GPRD 3i for bringing forth different R&D projects through Mouthpiece of GPRD Cell.

Shahmeena Husain, IAS

SHRI H P KOTHARI

DIRECTOR (TECHNICAL), GUVNL, VADODARA



During my various assignments in Gujarat State's power sector, I have personally observed and analysed that innovative methods and techniques are going to rule the world of energy generation, transmission & distribution. It will prove to be a major stepping stone in delivering consistent customer satisfaction and achieving critical milestones when it comes to supplying quality and uninterrupted power supply to those valued customers. Gujarat's power sector has taken a lead in this regards and is doing excellent job excelling in various parameters and achieving success at national level. In this journey, competent workforce complemented by path breaking power reforms, regulatory & administrative reforms, implementation of innovative methods & wilful actions has played pivotal role.

I strongly believe that creation of Gujarat Power Research & Development Cell (GPRD Cell) is a right step towards bringing much needed synergy of innovation, technological advancements, proactive administrative reforms and wilful measures in delivering quality power services to every consumer.

We know that R&D activity is a creative activity with a much larger implications in overall functioning and operations of the power sector. It has limitless scope to grow and avenues to explore. Each innovation is the result of endless efforts that has the potential of bringing paradigm shift as well as a proving to be a complete failure. However, it is with pride I mention that GPRD Cell has initiated more than 130 R&D projects in its four years of life span.

The WatchDog Transformer, Smart Feeder Monitoring System, GeoUrja, Online Testing Set, Pipe in-Cage Earthing, Air Break Switch with Earth blades, Communicable Air Break Switch, Static and Reactive VAR compensation of distribution feeder etc. are some of the very innovative and useful projects of the GPRD Cell which shall revolutionize power sector of not only for Gujarat State but also for our nation.

It will change the entire scenario of the Power Sector in much positive way when these innovative R&D products/services will be implemented in full-fledged manner at field level. So, it should be our prime goal to provide all kind of supports and encouragement to research projects at GPRD Cell for practical implementations.

I am honored to pen a few motivating words for the Research & Development activities carried out by GPRD Cell through this GPRD 3i volume.

I am congratulate all the scientists of the GPRD Cell for their endless efforts to develop innovative products and to the Editorial team for presenting it through the medium of GPRD 3i Magazine.

With best wishes.....



H. P. Kothari

SHRI R B PATEL

FORMER HEAD, GPRD CELL



Dear Tech-Savvy Readers,

Greetings of the season and thanks again for extending your support by giving valuable inputs to the first volume of GPRD 3i! ! It gives us an immense pleasure to present you this second volume!

We are a dedicated team of 13 scientists, whom the world knows as the GPRD Cell.....!

It is my pleasure to interact with you through the 2nd volume of GPRD 3i, i.e. Gujarat Power Research & Development Cell. In the first volume of GPRD 3i, the GPRD Cell submitted brief details of some of the projects related to our R&D activities and areas of research. We are, now, going to present you with some more and significant details.

I am in a very happy to state that the GPRD has undertaken more than 130 R&D Projects in a span of just 4 years!! And that too, through its limited but hardworking and talented scientists, a 13 men army!

We presented details of GPRD's researched product - "**the Watchdog Transformer (WDT)**" in the previous volume of GPRD 3i. It has turned out to be the pride for the whole India. This time, we are happy to present the details of the GeoUrja project in this volume.

It is generally and vastly conceded that the outcome of a research activity must reach to the farthest part of the society and mankind. Individually, I strongly believe that any research activity that is not going to benefit the farthest end of the society, can not be reckoned as the research. The research on the GeoUrja platform has made it to impart a long awaited solution to the issues related to the field asset management and techno-commercial parameters of the network of a DISCOMs.

In the coming days, we need to cultivate a scientific approach towards research so that the challenges of the energy sector can be effectively addressed through the innovative concepts and the research in the areas of the issues related.

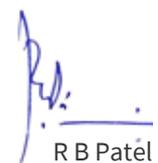
With the support of the authorities, the engineers and the employees of GoG, EPD, GUVNL, DISCOMs, GETCO and GSECL, we have undertaken more than 130 R&D projects. It is our pride that many of them after the deliberate experiments and testings have been successfully rolled out and implemented in the field. Some of the projects are under the experimental stage. I assure you that I will keep you updated, about R&D projects, by time to time through the forthcoming volumes of the GPRD 3i.

I am deeply grateful to the respective authorities, engineers and employees for their continual support in the field experiments. last but not the least, I congratulate my research team, who has been personally enthusiastic and self-initiated throughout this mission, for this successful R&D work.

I am confident that jointly we will continue to work on other research projects related to the issues of the power sector (and beyond!) and will be able to address successfully the challenges of the energy sector, not only in the state of Gujarat but our efforts will carve a path for the other states, also.

It will be my pleasure to have your feedback and suggestions on www.gprd.in for the R&D activities and for the GPRD 3i, which will encourage the team GPRD.

I am inviting you to be a part of GPRD 3i, by becoming a permanent reader or by contributing Research & Development articles/ideas of the Energy/ Power field for future issues.



R B Patel

MOVE FORWARD

MoU BETWEEN i-Hub & GUVNL

For supporting Innovations & Startups in the Energy Sector, on August 27, 2020, one MoU, in presence of Shri Saurabhshai Patel, Hon'ble Minister, Energy & Petrochemicals Dept. has been signed between i-Hub, Education Dept., GoG and GUVNL, Energy & Petrochemicals Dept., GoG, Gandhinagar

On August 27, 2020, one MoU, in presence of Shri Saurabhshai Patel, Hon'ble Minister, Energy & Petrochemicals Dept. has been signed between i-Hub, Education Dept., GoG and GUVNL, Energy & Petrochemicals Dept, GoG. Here, the first party as i-Hub (Gujarat Startup and Innovation Hub) is a vibrant incubation setup established under Student Startup Innovation Policy(SSIP) by the Education Department, GoG. Whereas , Behalf of Energy & Petrochemicals Department, the Gujarat Urja Vikas Nigam Limited is the second party in this MoU.

The main objective behind this MoU is that both the parties agree to engage through open innovation model in which researchers, innovators, startups curated by i-Hub will co-create with GUVNL for creating value.

Scope of the MoU

- GUVNL will finalise certain key thrust areas where i-Hub and GUVNL will make joint efforts in open startup/Innovation model;
- GUVNL shall provide the industry problem statements sourced from its various units which can be addressed by innovators, startups, and researchers;
- i-Hub shall circulate these problem statements among the students, startups researchers, and other stakeholders in the ecosystem and sensitize them;
- i-Hub and GUVNL will select the suitable proposals

from startups, Innovators which has potential;

- i-Hub will support incubation, Virtual Incubation and allied support to these shortlisted startups, innovators, and handhold them in their journey of Mind to Market;
- GUVNL shall offer mentoring support to these shortlisted Innovators, startups;
- GUVNL shall help these selected startups by providing backward and forward linkages.

For the part of the coordination of the programme, the activity under this MoU between GUVNL and i-Hub shall be coordinated by the representative of GUVNL and the CEO of i-Hub. GUVNL has nominated GPRD Cell, to work as the nodal for the same.

One Video conference was held between GPRD Cell and i-Hub on August 13, 2020 to move forward. For circulating among the students, startups researchers



and other stakeholders, 49 problem statements prepared by GPRD Cell & 6 problem statements prepared by PGVCL were given to i-Hub.

At the time of preparing the above problem statements, total four sectors as below are covered.

- IT & Automation
- Energy Efficiency, Smart Grid & Advance Metering
- Energy Security
- Power Quality, Safety and System Improvements

Program details

The entire program is designed in such a manner that it will support innovators and startups in 3 levels.

Stage 1: Idea to Proof of concept (POC)

In this stage, i-Hub will share problem definitions to the researchers/innovators and in stipulated time (3 months). The researchers/innovators will develop the first version of the product/service i.e proof of concept.

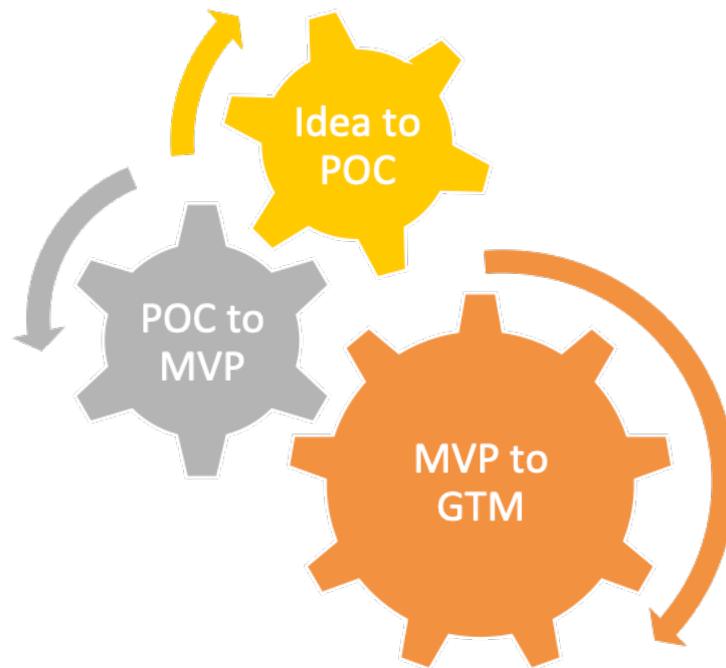
Committee will evaluate the POC and the selected one will go stage 2 (i.e incubation at i-Hub).

Stage 2: Proof of Concept (POC) to Minimum Viable Product (MVP)

At stage 2, i-Hub will have two inputs, one from stage 1 and second also those innovators who have already done some work in the defined problems and have a piloted their work. Here, i-Hub will provide seed grant and mentoring support to the selected innovators and by the end of the term (3 months) they will be given support to test their market viability. Those who sustain and test their MVP to 100 customers will qualify for the next round.

Stage 3: Minimum Viable Product to Go to Market/ scaling (GTM)

At stage 3, Pilot deployment and benchmarking would be done and then they will be provided with market integration i.e selling their final product/service to the customers. Here, i-Hub will provide them scaling opportunities.



OUTSET

■ GPRD 3i INAUGURATION

The magazine signifying GPRD activities as “GPRD 3i”, its first volume, inaugurated by Hon’ble Mr Sujit Gulati, the then ACS, E&PD, GoG & Prof Sudhir K Jain, Director, IITGN, on December 19, 2019.

The concept, content and color design of the volume is appreciated by them. They told that the Editorial in the volume, perfectly matches with the ideas behind the establishment of the GPRD Cell. The volume would be the best instrument for the different stakeholders of the GPRD Cell who are wishing to know about the Cell, in detail.

This Cell is working on many Research & Development projects on updating or further improvement in designs of different types of materials, improvement in network efficiency, implementation of automation, IT enabled applications, cultivation of renewable energy resources, exploring energy storage, Electric Vehicles etc. The cell’s these activities are related to the Energy Efficiency of Power Network, Power Quality & Safety, Power Reliability, Renewable Energy for environmental benefits and improving customer services, etc.

Since July 2017, The GPRD Cell has started its business at IITGN, more than 125 R & D Projects have been initiated by this Cell in its three years of tenure. Total ten applications have been filed for Patent’s Rights by this office. WatchDog Transformer, GeoUrja, Air Break Switch with Communication, Stone Less Drop Out fuse etc. are the best research projects, not only for this Cell or state, but also across the India.

This GPRD 3i volume would be the best instrument for updating to its all stakeholders about the activities of the Cell.

HONOURER VISITANT

■ SHRI SUJIT GULATI, IAS

Shri Sujit Gulati, IAS, the then ACS, E&PD, GoG, Gandhinagar and the then Hon’ble Chairman to the Executive Committee, GPRD Cell visited this Cell and reviewed the different Research Projects & activities of the GPRD Cell on 19-12-2019. He is an IITian and a learned person, he shall always be a light house for paving the path for the GPRD Cell to a new horizon in the Power sector. He did believe that the R&D activities differ from the routine business of a State utilities. The ideas that may get converted into a usable product or system can only be transformed through the Technology at disposal. One of the thumb rules for the R&D activities, a failure is the ladder to success, was taught to the Cell by this long-sighted bureaucrat. He made us to think ‘what next’ on every occasion of an achievement. The Cell dedicatedly pursues with the “ 3i ” s as imagine, innovate and implement for the activities related. He, also, empathised upon undertaking the research activities to develop System and Products that enhance the service quality and safety to the life and assets, with economic viability.

DELINEATE

RESEARCH PAPERS

REMOTE METERING THROUGH LORA WAN

Remote meter reading in remotely located scattered Agricultural Areas through LPWAN technology – An effective Techno-commercial solution for DISCOMs

Mr H M Sakariya, BE (Ele.), ACPDM

R & D Engineer

Gujarat Power Research and Development Cell

Gujarat Urja Vikas Nigam Limited

Research Park, IIT Gandhinagar

Mr R B Patel, BE (Ele.), Energy Auditor

Former Head

Gujarat Power Research and Development Cell

Gujarat Urja Vikas Nigam Limited

Research Park, IIT Gandhinagar

Abstract— Meter reading in the remotely located and scattered agricultural (AG) areas is a big issue for every distribution utilities in India. There are various factors, which cause the poor meter reading accuracy, for this category of the consumers. This, in turn, causes huge commercial loss to the utility and ultimately the utilities have to bear huge revenue loss.

To overcome this issues, Gujarat Power Research and Development (GPRD) Cell- A Government of Gujarat Initiatives- has taken up a pilot research project, of an LPWAN (Low Power Wide Area Network) based metering system. This system can be retrofitted to the existing meters. The LPWAN has the main advantage of covering a long-range through wireless RF which is best suited to the rural area scattered meter reading. This paper describes the meter reading difficulties, being faced by the DISCOMs for the AG consumers. Why the technological selection for LPWAN was made – its advantages and disadvantages, the comparison of various metering communication technologies and discussion on the case study of a pilot project of remote meter reading by LPWAN is undertaken by the GPRD cell.

Keywords—LPWAN, Remote Meter reading, AG Consumers.

I. Introduction

Use of the IoT devices are increasing at a rapid rate,



especially in developed countries. India, being a developing economy, is also following the same footsteps. Gujarat has taken a very good initiative by implementing the “Suryshakti Kisan Yojana”-SKY. The scheme is for the installation of the Solar System on the farm of farmers. The Farmer sells surplus energy to the DISCOMs, after his irrigation usage. The entire communication of all the meters installed in the premises of farmers are on the IoT base.

In India also, the development of laying the LPWAN based IoT network has already started. The giants like, Reliance, Bharti Airtel, Vodafone Idea, who are already having their Cell-Phone Networks, are planning for the development of the NB-IoT based LPWAN. Whereas the players like Tata Communications and SenRa are also making efforts to build a parallel network, called Low Power Wide Area Network based on LoRa WAN technology, to drive India’s IoT ecosystem. It is certain that metering application can’t stay away for more time in this race and it is much needed also.

II. Challenges of meter reading in AG areas

Meter reading in the AG areas faces various challenges:

1. Consumers are scattered in a very wide area. The meter reading cost at an average is as high as around 60 Rs. per consumer and it will get escalated day by day. (30 Readings/day). Also, the approach to such locations are very difficult, which ultimately leads to the blocking of revenue as the electricity bills are

- issued without actual meter reading in such cases.
2. In case of Gujarat, the AG consumers get 3 Phase power for 8 hours and the schedule gets rotated on a weekly bases. (Evening time, Day time, Night time), therefore many a times, when the meter reader visits the premises for meter reading, it is found locked. This makes the accurate meter reading quite difficult.
 3. Many of the AG consumers are, also, using the automatic switch to turn the motor on, so that they don't have to go to the farm or control panel for starting the irrigation. Under the Situation, premises are, also, found locked. This causes, erroneous and faulty billing.
 4. In monsoon, the locations of the AG consumers are so difficult to approach that even the hired vehicle can't go to the places of meter reading. Besides, the irrigation by bore well motor is not required, if the rain is sufficient. So, the farmers keep the starter rooms locked and the meter reading becomes difficult.

The AG consumers are largely subsidized (In Gujarat, Ag. Metered Tariff is Rs.0.60/kwh) and hence the bill amount incurred for the power consumption to the consumers are comparatively quite low. However, the per unit landing cost to DISCOM is around Rs. 5.80 per Kwh. The remaining amount is subsidized. So, the accumulated units of the meter due to improper meter reading is causing a high amount of commercial loss.

It was the need of the time that, a cost effective technical solutions should be arrived at which can address all these issues. In the era, where Gujarat has almost replaced all the electromechanical meters by the static meters, the switchover to the total smart meter solutions is not economically viable to the DISCOMs. Also, smart meter technology such as GPRS, Zigbee is not much effective and economically viable in AG rural areas where there are issues of network signal strength.

The intent of the pilot project of remote meter reading for AG consumers:-

1. To explore the technical feasibility of the LPWAN technology to penetrate through long range.
2. To overcome the present issues of manual meter reading, especially in AG areas, where meter reading is less accurate, even erroneous and difficult to take.
3. To ensure communication range and consistency of LPWAN technology in scattered rural areas. To come up with the technology, which has very low running cost, accuracy and very less Capex is required.

III. What is LP WAN ?

A low-power wide-area network (LPWAN) or low-power wide-area (LPWA) network or low-power network (LPN)

is a type of wireless telecommunication wide area network designed to allow long range communications at a low bit rate among things (connected objects), such as sensors operated on a battery. The low power, low bit rate and intended use distinguish this type of network from a wireless WAN that is designed to connect users or businesses, and carry more data, using more power. The LPWAN data rate ranges from 0.3 kbit/s to 50 kbit/s per channel.

There are various LPWAN platforms and technologies developed by various developers across the globe. A few of them are as below.

- LoRa
- Dash7
- Telensa
- Nwave
- Weightless SIG
- NarrowBand IoT (NB-IOT)
- NB-Fi Protocol, etc.

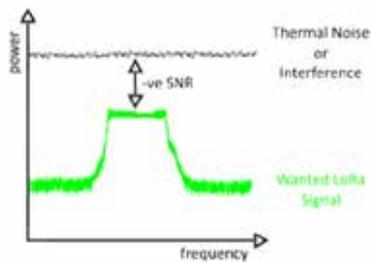
(Source: Wikipedia)

LPWAN technologies have been used in the field since a long time. However, as technologies progress, the demand for IoT based devices also increases. The IoT based devices are used in the field of Smart Parking, Agriculture, smart grid, smart home and automation, asset tracking and monitoring, weather detection, etc. With the increasing trend towards smart devices, the demand for the technology, which has low initial and running cost and low power consumption, is also increased. Improvements in silicon technology have made it possible to achieve the above targeted techno-commercial aspects. These take advantage of sub-GHz unregulated radio bands for long-range connections that can be more cost effective than the regulated cellular bands.

However, these LPWAN networks require their own infrastructure to be rolled out. However, this has now reached a turning point. Using the sub-GHz band for LPWAN means fewer base stations are required to support a large number of wireless nodes.

Advantages of LPWAN:-

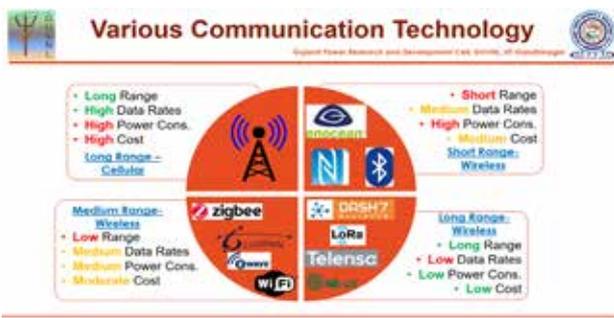
1. It has quite a low power consumption. So, the battery life is as high as 10-20 years.
2. It has quite a Long Range (2-5 km in urban areas and upto 15 km in rural areas).
3. The installation cost and running cost is quite low compare to other technologies.
4. It has high robustness to interference for quite a long range. For ex. LoRa is the spread spectrum based modulation technique, in which, the signal is received with a negative Signal to Noise Ratio. This enables the technology to perform in both high noise and low noise environment quite efficiently.



(Source: Semtech)

Limitations of LPWAN Topology:-

1. It has quite a low data transmission rate. The data rates in the LPWAN technology varies from 250 bps to several kbps. This limits the technology from transmitting the bulky data. However, there is a facility called ADR (Adaptive Data Rates) in which High network capacity in an LPWAN network is achieved by utilizing a multichannel multi-modem transceiver in the gateway so that simultaneous messages on multiple channels can be received.



IV. Comparison of various technology

The comparison chart showing key advantages and disadvantages of various communication technology is displayed here.

The widely used short-range radio technologies (e.g., NFC, Bluetooth) are not adapted for scenarios that require long range transmission. Medium range communication technologies such as ZigBee, 6 LowPAN, etc. require much infrastructure in the application which covers a wide area and require low data to be transmitted. Solutions based on cellular communications (e.g., 2G, 3G, and 4G) can provide larger coverage, but they consume excessive device energy and has a high running cost.

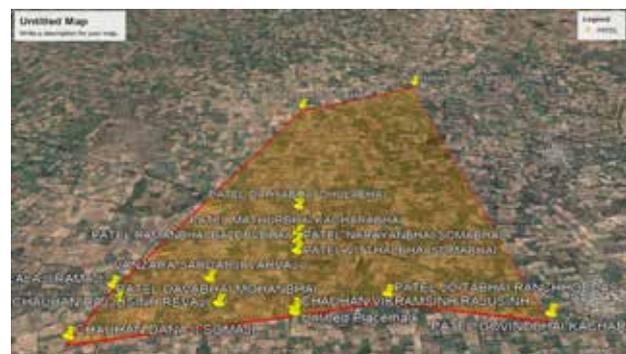
Therefore, IoT application requirements have driven the emergence of new wireless communication technology: low power wide area network (LPWAN).

It is quite evident that, LPWAN technologies has edge over the other communication technology for application of remote meter reading in AG areas/rural areas. As the data reading frequency required for the AG areas are not as critical as HT consumers, the low data rates would not hamper the usefulness of the technology. Also, the Capex requirement is very low, in

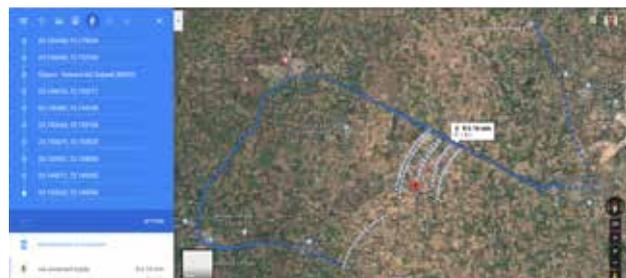
case we want to retrofit the module with the existing static meter. The running cost is as low as 20 paise / node (considering 100 meters cover under a single gateway).

V. Case Study

The pilot research project of the LPWAN based communication technology was conducted by GPRD Cell at Ladol Subdivision of the Vijapur division, under Uttar Gujarat Vij Company Limited (UGVCL), Gujarat. The data of consumers and geo locations were gathered for 20 scattered consumers. The aim was to cover the maximum area with a single master device (Gateway). The data frequency becomes the less critical aspect, the total area covered needed to be maximum. The Geo location captured of the consumer location was plotted on the google earth to know the total area covered in the project. The screenshot of the google earth is as below.



The total area of the polygon covered, measured on the google earth is found to be 80, 37,269 Sq. meter and the perimeter of the polygon are found to be 12,526 meters. The data of these 20 connections is being captured using a single LPWAN gateway. The data frequency is varying from 5 min.-2 hour.

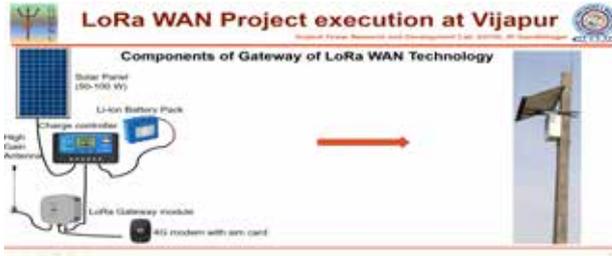


The geo locations of all the consumers were plotted on the google maps and the route distance for meter reading was calculated which comes about 41 km for 20 meters. The data frequency is been monitored since the last 3 months and is found reasonably well.

- There are two parts of the LPWAN system
1. Node device to be attached/retrofitted with each energy meter.
 2. Master device to be installed at one location preferably center of the all nodes.
- Various components of the system is as below.



(Part-1) Node device - To be attached with existing energy meter



(Part-2) Master device – To be installed at centre of various metering nodes.

VI. Conclusions and Outcome

The AG areas are always challenging for any DISCOMs to take the meter reading as well as vigilance activities. As the areas are scattered over the wide area and have very low Concrete and other obstructions, the LPWAN technology can be very useful. Also, LPWAN has a limitation of quite a low data rate, which is not a big issue for an application of meter reading in AG area as the data frequency requirement is not that critical. Although, for 100 no.s of meters, the data frequency can be achieved in the range of 1 Hour-4 Hour.

As the mass meter replacement plan has been rolled out in Gujarat since 2010 in which most of the AG meters are converted into the static meters. The technological transition from the static meter to a smart meter for the purpose of meter reading is financially not viable. Also, the disconnection cases in the AG areas are quite low as the bill amount is not that much high compare to the consumption of expensive diesel based IC engine used for irrigation and once the consumer becomes disconnected and isolated from the network, he/she has to wait for quite a long period to become the consumer again, if he/she wants to become.

Due to the aforesaid reasons, LPWAN becomes economically and technologically a quite viable option for remote meter reading in AG areas.

References

- [1] A technical overview of LoRa® and LoRaWAN by TUV e Rheinland
- [2] Various documents from <https://www.semtech.com/>
- [3] <https://telecom.economictimes.indiatimes.com/news/reliance-jio-airtel-spar-over-nb-iot-readiness-india/68689358>
- [4] <https://www.thethingsnetwork.org/docs/lorawan/>

- [5] <https://www.rohm.com/electronics-basics/wireless/short-range-wireless-communication>
- [6] <https://www.link-labs.com/blog/6lowpan-vs-zigbee>
- [7] <https://en.wikipedia.org/wiki/LPWAN>
- [8] A comparative study of LPWAN technologies for large-scale IoT deployment – Kais Mekki, Eddy Bajica, Frederic Chaxela, Fernand Meyerb.
- [9] <https://www.i-scoop.eu/internet-of-things-guide/lpwan/>

Authors

**Mr R B Patel, BE (Ele.), Energy Auditor
Former Head, GPRD**

He has over 30 years of experience in various utilities of Gujarat. Through his career, he has contributed in many research and development related activities for performance improvement of DISCOMs. His area of interest is in Transformer designing, underground system designing, GIS, Renewable Energies and energy auditing and Water and Energy conservation. He was also key inventor in the development of SDT (Specially designed Transformer), PLMT (Plant Load management transformer), WDT (Watch Dog transformer) which are registered under the Intellectual Property Rights.

**Mr H M Sakariya, BE (Ele.), ACPDM
R & D Engineer**

He is currently working as an R&D Engineer at GPRD Cell, GUVNL. He has, in total, seven years of experience. In the initial stage of the carrier, he has served with ERDA, as an Assistant Engineer for around 3 years, in which he worked in areas of Product Testing & Inspection, Condition monitoring, Fault Diagnostics, Calibration & Quality Management, Energy Audit of various electrical apparatus. Then, he joined PGVCL, in which, he was assigned the role of Lab testing engineer overseeing the operation of testing of various kind of Meters, CT PT unit, etc. Then he was selected at GPRD cell, GUVNL through internal recruitment, in which, he was assigned the role of R&D Engineer, in which, he has made research in the field of Various Power quality related issues of DISCOMs, Meter communications through LPWAN, Renewable Energy projects, Battery Energy Storage Systems (BESS), Improvement of safety by earthing systems, etc.

ADJUDGE

AWARD



Gujarat Power & Research Development Cell's activities are adjudged...

AWARD NAME	AWARD FOR	AWARDED BY	AWARD DATE
Smart Gujarat For New India Hackathon - 2018	Comprehensive Mentoring	Education Department, GoG, Gandhinagar	16-05-2018
Skoch Award	Solar Energy Data Management System With Meter Console And Watch Dog Transformer	Skoch Group, New Delhi	25-09-2019
Skoch Award	Smart Energy Management For The Grid Connected Solar Agriculture Prosumers And Consumers	Skoch Group, New Delhi	25-09-2019
ISGF Award 2020	lot Based Monitoring And Controlling Of Distributed Solar Energy Resources With Grid Support Through Sky	India Smart Grid Forum, New Delhi	06-03-2020
SKOCH Award	GeoUrja - Easy Survey Mobile Application	Skoch Group, New Delhi	31-07-2020



Smart Gujarat
For New India Hackathon
2018



Skoch Award
For Solar Energy Data Management System With Meter
Console And Watch Dog Transformer
2019



Skoch Award
For Smart Energy Management For The Grid Connected
Solar Agriculture Prosumers And Consumers
2019



ISGF Award 2020
For IoT Based Monitoring And Controlling Of
Distributed Solar Energy Resources With Grid Support
Through SKY
2020



SKOCH Award
For GeoUrja - Easy Survey Mobile Application
2020

ROCK CLIMBING

TEXT FROM THE DESK OF EDITOR: GEOURJA

As we know that the most concern issue for any of the DISCOMs is a perfect authentication of the various database those are in the forms of the existing Electrical Network and Consumer Locations, the position of Consumers & Transformers, HT & LT Poles, Cable route & Switching devices etc. It is experienced that sometimes DISCOMs unable to provide uninterrupted and safe Power Supply to the Consumers, due to the incomplete database of various items concerned with the DISCOMs.

Looking to the high-level requirement for the perfect authentication of the various database related to Generation, Transmission & Distribution, the GPRD team has taken up the research project to address these difficulties faced by the DISCOMs by developing “GeoUrja”.

CURRENT SCENARIO

It has been seen that many DISCOMs tried to collect and update all types of Electric Network assets by using GIS. But, no DISCOMs have worked to gather the database and information of the electrical assets by using Geo-Tagging. It has been seen that the database and information of the Electrical assets have been gathered in City / Town or Urban areas only by using GIS / GPS across the Nation. Few DISCOMs have already worked out to collect the database and information of the Electrical assets with the support of a Private Partner or by using the outsourcing option in many States. It has been also seen that the application prepared for the collection of the Database and Information of the Electrical assets was compatible only with the Desktop, but not compatible with the Mobile or Tablet.

LIMITATION OF PREVAILING PRACTISE FOLLOWED BY THE DISCOMS

As we know that sometimes, each power transmission and distribution company have not accurate Databases and Information of the Electrical assets. DISCOMs have not perfect Network & Consumer GPS mapping. Earlier 2014, under Restructured Accelerated Power Development and Reforms Programme, few works were done but due to lack of expertise and requirement of a special device, GIS data are not regularly updated it. Also, updating of the Base Map is expensive due to required special licenses.

The DISCOMs possess a random asset mapping. Still, major part of the network is not digitally mapped and no location based information of the assets and the network components is available. This entails the random analysis and improper, erroneous results. Besides, the inappropriate lay of the network leads to mislead calculations. Many GIS programs and traditional asset management programs (primarily asset-class specific tools) have complex system architectures. Therefore, integration and interfaces between them can be very complicated. GIS is often considered for planning function while asset management is considered for engineering and/or maintenance function. Organizational alignment and understanding can make it difficult to coordinate. The biggest problem that electricity utilities are facing to store the historical data and updating on account of the real-time addition, alteration and changes on the field. There is a limitation of integration with the existing ERP, Billing and SCADA systems. Software is an intellectual property and its need regular support to update it from the vendor. As the utility work with area wise local servers and different proprietor's GIS platform, it becomes utmost difficult to manage with the data.

About GeoUrja

GeoUrja is a software application developed for GPS survey of the existing Electrical Network and Consumers' locations by using a Smart Mobile device. This software application is also useful to know the position of Transformers, HT & LT Poles, Cable route & Switching devices.

These various Data will manage dynamically for addition or modification in the Power Distribution System. GeoUrja is an open-source cross-platform of GIS Cloud technology which will help to the utilities to manage the relevant information about the Customers, Distribution and Transmission Network with a perfect overview of the entire system & visualizing on a map.

Graphic data and attributed data are stored in uniform by using open-source spatial database PostgreSQL/ PostGIS. This will give us a digital view of the Electrical Network over the land base map, this will helpful for providing information about Assets and Consumers. The newly developed Easy Survey Android Mobile Application is designed for combined GPS tracking and Network line drawing methods to achieve maximum time efficiency and accuracy when mapping and managing large areas covered with the Electricity Distribution and Transmission Network.

Users will get location wise real-time Information of the Power Network at any place. Fault location finding is possible and Power supply restoration time will be reduced. Consumer location search and navigation are possible in Mobile for quick redressal of Consumer's complaints.

DELIVERING TOWARDS THE SITUATION BY "GEOURJA"

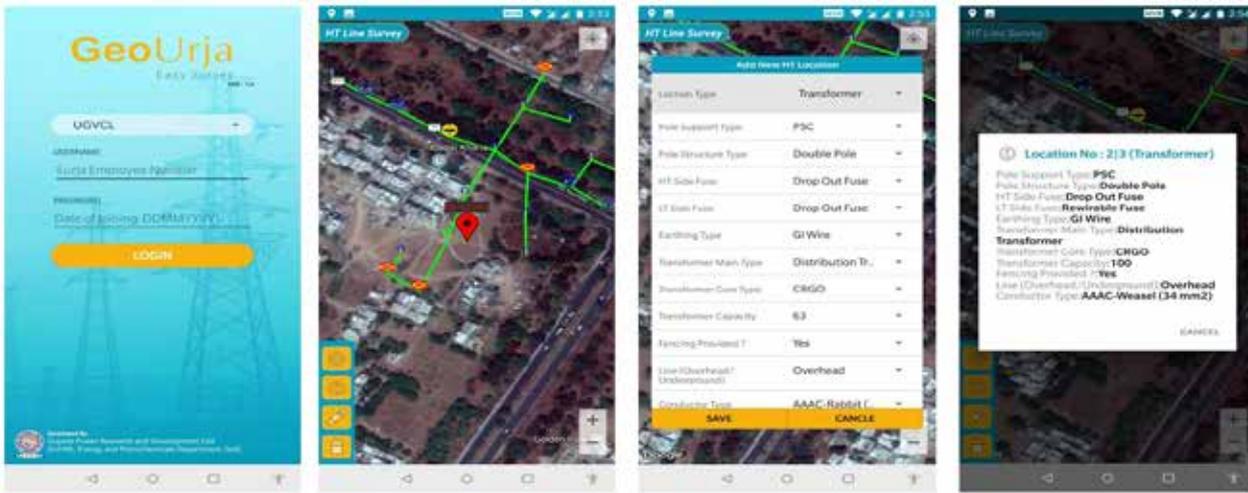
GPRD Cell has designed & developed GeoUrja under four platforms as per below:

- 1. EASY SURVEY MOBILE APPLICATION**
- 2. DISCOM DASHBOARD**
- 3. GETCO DASHBOARD**
- 4. GUJARAT POWER PORTAL**

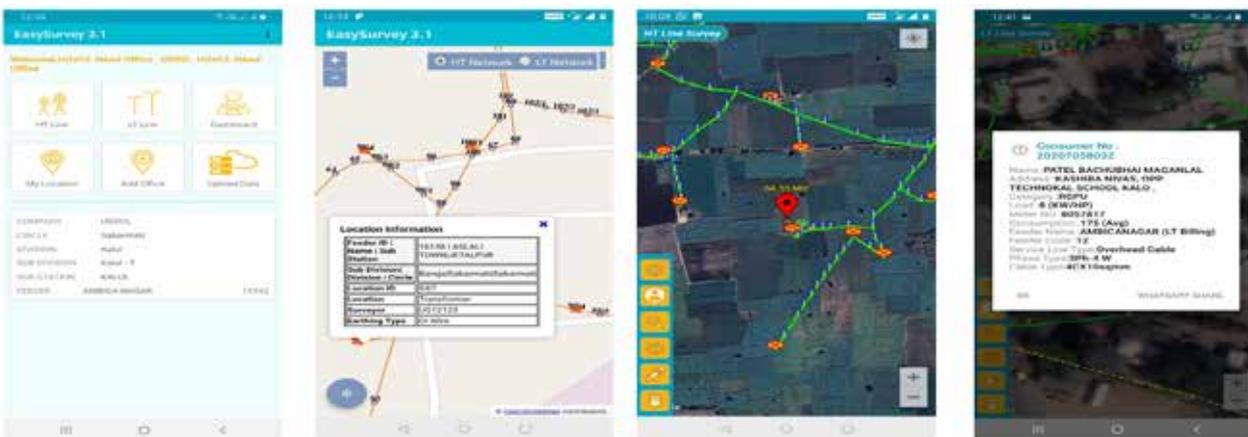
1. EASY SURVEY MOBILE APPLICATION

Main functionality of Easy Survey Mobile App is to collect data because it is inevitable in GIS system. There are two types of data in GIS. The first one is called spatial data which is in relation to spatial location and spatial relationship; the other is called attribute data, which is the non-spatial attribute information of geographic entity. In the traditional applications, the data mentioned above are stored separately. Attribute data is stored in relational database and spatial data is stored as a file because of its particularity. With the development of database technology, it is the direction that GIS software describes and stores spatial data in an object-oriented manner.

Easy Survey mobile application is used for the GPS survey of an existing Electrical Network and the Consumer locations, by using a User's Smart Mobile device. The GPS data will be plotted on geo-referencing of area for designing and preparation of the overhead and underground network system. Every feature (locations, attributes, etc.) has to be incorporated accurately with the respective object of the Network.



The position of an Electrical Poles, Transformers, Switching devices, Cable route points etc. shall be marked on the drawing furnished as shown in Fig. 01. According to the characteristics of electrical equipment in a Transmission / Distribution Network, the equipment primitive is designed to meet the requirements of Power utilities in the aspects of relevant symbols. These symbols attribute such as color, line type, line width and so on are used to represent different segments of the running states and different component types.



As shown in Fig 2, the same Mobile Application has additional functionality to utilize the point buffer analysis function of GIS development platform, by traversing the bus objects and terminal objects as listed under:

- Feeder Network Information with HT and LT Network over the Satellite image.
- Consumer Basic Detail
- Geo Navigation option for Consumer and Electrical asset search.
- Overhead / Underground Network Information as per the current location of the User.
- Real time Information of Power flow from the selected devices.
- Geo Navigation of Electrical Asset and Consumer location

2. DISCOM DASHBOARD

Using this DISCOM Dashboard, Users can access all the Data related to their surveyed Feeders in several view formats. It provides, User's role wise Statistical Information, Surveyed Data of each Feeder, rich Vector based Maps & Geographical Map of the Feeders, also, allows Users to export Maps into Portable Document File(PDF) format with standard sizes.

2.1 STATISTICAL INFORMATION

The below screen is an example of how the DISCOMS' Feeder Statistical Information is being displayed to the User level, Organisational based filters are available, by which, the User can easily get all the Statistical Information related to that object.

2.2 FEEDER DATA

In the Feeder Data option, we can see, all the Data related to surveyed Feeder including total Locations, line length in KM, total Transformers, Switches, DO Fuses, Consumers and so many other Information.

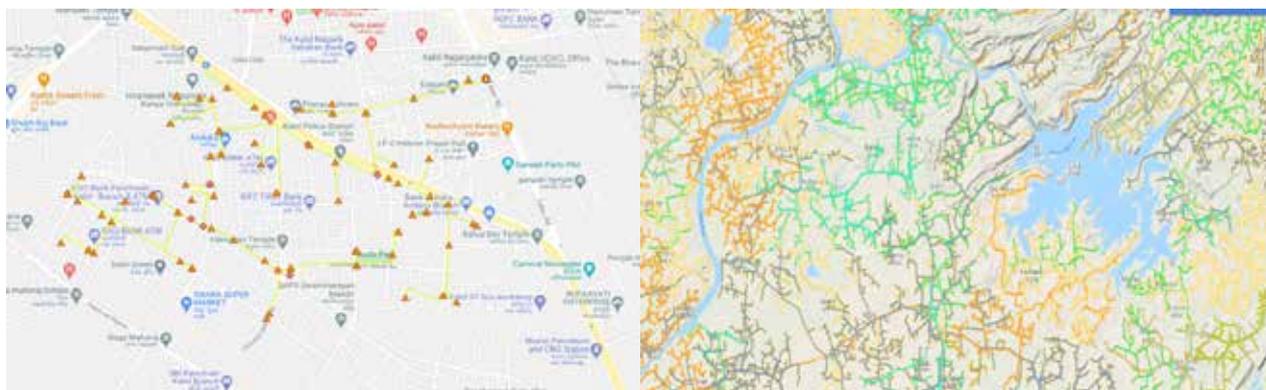
2.3 VECTOR BASED MAP

A rich Vector based Map is the solution for the Feeder analysis, as well as Network study. It can be accessed to show & hide the components on the Map, which makes Feeder analysis better and precise. It also allows us to download & export the Map in a Portable Document Format (PDF).



2.4 GEOGRAPHICAL MAP

The Geographical Map is an elegant view of a Feeder. By using Geographical Map options, the Users can see the Network of a Feeder geographically, which is helpful to understand the entire Feeder flow as well as to get the idea of the Feeder for a road crossing, river crossing, change of Feeder configuration to reduce technical losses, etc.



2.5 FEEDER MAP EXPORT FACILITY

Not only digitally but one can also see a Map of the Feeders on paper. A Vector based Map on the dashboard allows to download/export a Feeder Map with several standard sizes, so one can print it for the official paperwork and documentation for hard copy purpose. Also Feeder line crossing with location and attribute can exportable.

2.6 FEEDER BIFURCATION FACILITY

The system automatically calculates % HTVR as well as theoretical losses of Distribution Feeders with minimum inputs of the data. It also facilitates the Users to calculate both the parameters for existing as well as modified and for the proposed Feeders. This is much helpful in the Substation bifurcation also.

2.7 SAMPRAK

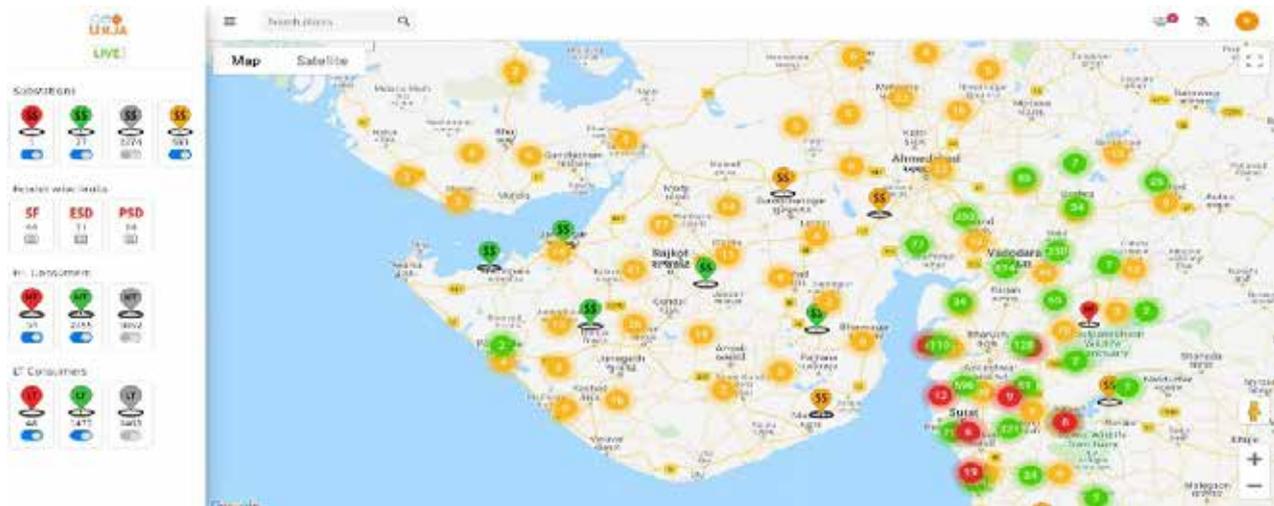
GeoUrja Sampark is a joint platform of DISCOMS' Electrical Network and Google Map. Through this platform, the User can get the details of the Electrical Assets and many levels of Power connectivity. In this platform, there is a search facility to get the Information of the Consumer's Name, Place, No. & Geo-Coordinates etc.

2.8 GEOURJA LIVE

The Innovative Dashboard is design for the a Power live status that collects the Information from Sub Stations, SCADA, Meter Modem, Switches, etc and represents on a single platform with Power Network Information. It shows real-time Power status of the Consumers. The On/Off Power status of an HT and/or LT Consumers can be captured from the existing Meter Modem by using Power status change SMS and the same has been integrated with the GeoUrja Live Dashboard.

With the GeoUrja Live Dashboard, Users can monitor Consumers' live status, outage history, outage durations, Consumers' basic information & Feeder Network view. Centralized Power status monitoring will be supported to

advance the Power reliability of Consumers and also, it is much helpful in the prevention of leakage of revenue to the DISCOMs.



3. GUJARAT PORTAL

GETCO Portal comprises Power Transmission Network with Substation location and Network view with land base Data, Administrative boundary and basic land layers. This will be benefited to the User for quick and effective planning of the Network.



4. GUJARAT POWER PORTAL

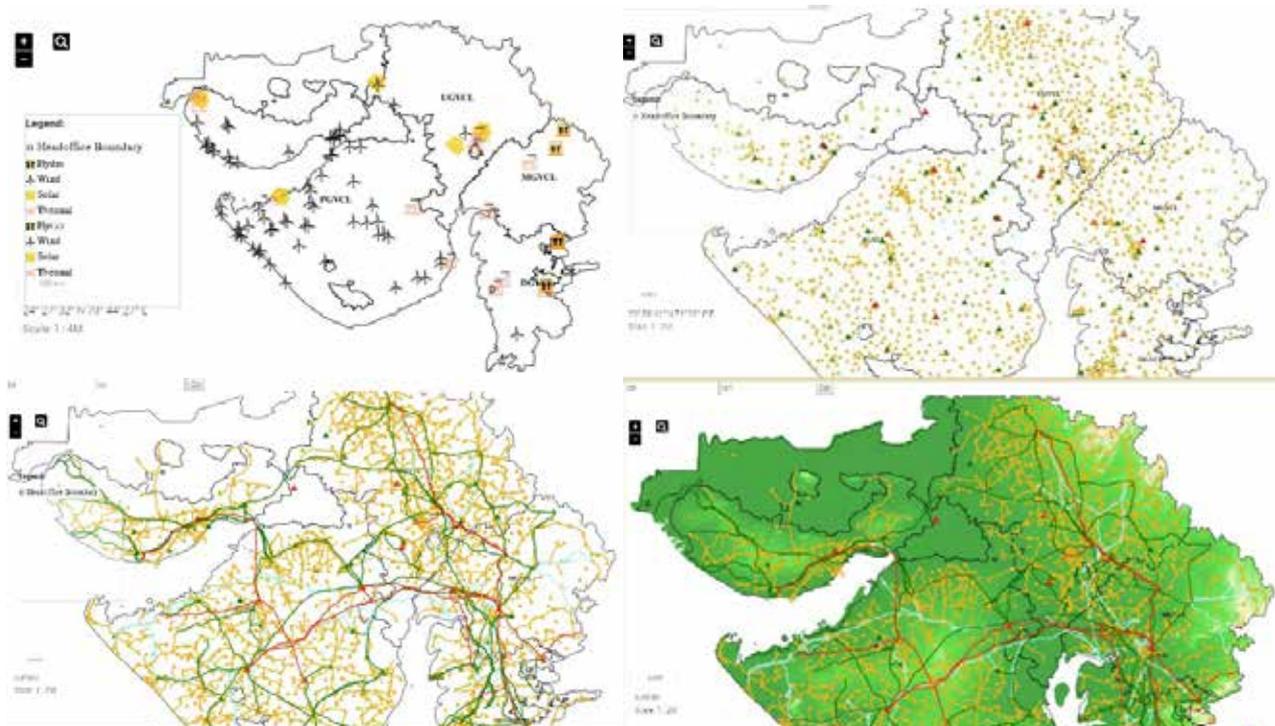
The Gujarat Power Portal provides the facility to view the Power Generation locations of GSECL, the Transmission Network of GETCO and the Distribution Network of the DISCOMs, up to the Consumer level, on a single Geo-platform. It also provides multiple layers of Information, as mentioned below in key features.

GUJARAT POWER PORTAL is facilitated with

- DISCOMs' boundaries: DISCOMs wise, Circle wise, Division wise, Subdivision wise, Geographical view
- Revenue boundaries: District wise, Taluka wise, Village wise
- Digital layers of Roads, Rivers & Rail Network
- Satellite Images
- It is planned that the User can get the Consumers' details with Survey no. wise Boundaries, Map and its Ownership.

STRATEGIC ABILITY

At the time of development and implementation of GeoUrja project, the GPRD Cell has received many fruitful responses, useful ideas and suggestions from every level of the DISCOMs, GETCO and GSECL's different Authorities, Engineers and Employees. Therefore, this GeoUrja platform is made end User-friendly and low-cost application. Now, The GeoUrja is a platform that accommodates and demonstrates the tools used to operate the enterprise functioning for the Power Sector utilities. It acquires the real-time and historical information of the Energy Data.



The Enterprise solution “GeoUrja” will cover the range of information about the Asset Information, Data modeling, integration and make analysis for better Management Decision Support System for improvised Consumer services.

Team GPRD is continuously working on the updation of the GeoUrja platform by adding more helpful features after receiving endless suggestions from the field-staff to make this project more and more useful and to reduce the toil of utilities’. Finally, these vigorous brainstormings are converted into better services to the Stakeholders by utilizing an accurate Database

SOUNDLESS NATURES

- User-friendly application
- Useful for rapid move on many DISCOMs issue
- More accurate
- Default automation in different Databases and routine works
- Low-cost application
- Increased personnel’s performance
- Easy analysis of many types of Database
- Accuracy in the database of Transformers, LT & HT lines & Consumers, Poles, Switches, RMUs etc.

CONCLUSION

In comparison to the present practice, the basic idea of using this GeoUrja is more accurate in all types of Databases. It is a low-cost application by comparing with the other options for gathering different Databases. This application is useful for the rapid move towards many issues. Many functions of DISCOMs are converted default in automation. Performance of the personnel of DISCOMs will be increased that convert in more accuracy.

FIELD STUDY REPORT

With the support of all Utilities’ Authorities, from the top to bottom, 98% of the HT Network, 65% of the LT Network, 97% of the Transformer Centre Population, 89% of the HT Consumers and 48% of the LT Consumers’ Database have been digitized. With the support of highly self-motivated Engineers and Field staff, every day, an average of more than 10,000 locations are being digitized on this GeoUrja platform. That is a recordable achievement and the best, positive and User-friendly atmosphere towards the implementation of GPRD Cell’s GeoUrja project.

It is a pride for the Gujarat Energy sector that, across the Nation, no Government Power Supply Utility has achieved this milestone.



Mr J H Borisagar
Deputy Engineer(R&D)

REMOTE INTERACTION

WEBINAR

We know that a Webinar (Web-based Seminar) is a presentation that is transmitted over the Web. It is interactive via Web base two way Communication where Participants can discuss, send and receive in simultaneous each other's Ideas. In Webinar, it is live and Web based two way audio - visual transmission.

The GPRD Cell is equipped with necessary infrastructural facilities to update the all GUVNL's subsidiary Companies' Workforces through organizing different Webinar Programs.

This Cell has organised its **Webinar-1** on October 3, 2019 on the subject of **Functionality and Capability of GeoUrja - DISCOM Power Portal In the Webinar** and the **Webinar-2** was organised on October 24, 2019 on the subject of **GPS-GIS mapping of Electrical Network by Easy Survey Mobile Application 3.1 under the GeoUrja Project**. Both Webinars were Hosted by Shri R D Patel, Deputy Engineer(R&D), GPRD Cell. The details about these webinars were covered in first volume of GPRD 3i.

In a sequence of above, more webinars were organised by this Cell. The details are as under.

Webinar-3

Additional Functionality and Capability of GeoUrja - DISCOM Portal & Easy Survey App - 3.5

Hosting by: Mr R D Patel, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Thursday, March 26, 2020

Webinar-4

GPS-GIS Mapping of Electrical Network by Easy Survey Mobile Application Under the GeoUrja Project

Hosting by: Mr R D Patel, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Wednesday, April 22, 2020

Webinar-5

Easy Survey Mobile Application & DISCOM Power Portal

Hosting by: Mr R D Patel, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Thursday, May 21, 2020

Webinar-6

New Update in GeoUrja

Hosting by: Mr R D Patel, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Saturday, June 6, 2020

Webinar-7

Importance of GIS in Electric Network System

Hosting by: Mr J H Borisagar, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Saturday, June 27, 2020

Webinar-8

Easy Survey Mobile Application & GeoUrja Platform

Hosting by: Mr R D Patel, Deputy Engineer(R&D), GPRD Cell, GUVNL, Gandhinagar

Date: Tuesday, July 21, 2020



Mr R D Patel
Deputy Engineer(R&D)



TREKKING

FROM FIELD TO NATIONAL ROSTRUM

1. On November 4, 2019, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) experimented the designing and testing of the basic circuit of HT live line indicator with the help of lab staff of IIT-Gn at IIT Gn, Gandhinagar.
2. On November 5, 2019 , Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited Vadod JGY feeder of Vinchhiya subdivision under PGVCL for the inspection of Common Earthing for HT lines.
3. On November 7-8, 2019, Behalf of GPRD Cell, Mr J B Upadhyay, EE(R&D), Mr R D Patel, I/c EE(R&D) & Mr S P Rathod, JE(R&D) attended the seminar on “Distribution Utility Meet(DUM) – 2019” that organized by ISGF, New Delhi.
4. On November 11, 2019, the GPRD team presented various R&D projects’ activities before Honblé MD of MGVCL, Baroda and received his valuable suggestions to the field of Energy Sector and day to day Energy Sector’s field issues related new ideas.
5. On November 25-29, 2019, Mr U N Joshi, JE(IT) & Mr M A Vhora, SA(R&D) & Mr J B Vadgama, JA(R&D) attended the Professional Development Program on “Cyber Security & Forensic Investigation Tools & Techniques”, At Hyderabad, Telangana
6. On December 3, 2019, Mr H M Sakariya, JE(R&D) made a presentation on the “Impact of Distributed Energy Resources on the Grid” into the Conference on “Distributed Energy

Resources & Energy Management”, at IIT Gn followed by the visit of Nityanand SKY feeder, Dahegam rural subdivision under UGVCL.

7. On December 7, 2019, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited the Kadi-1 subdivision under UGVCL for the inspection of Common Earthing for HT lines project.
8. On December 11, 2019, Mr R B Patel, Former Head, GPRD Cell, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited State Load Dispatch Centre, Baroda for the meeting with GPCL and SLDC officials on the Battery Energy Storage project.
9. On December 17, 2019, Mr R D Patel, I/c EE(R&D), Mr J H Borisagar, DE(R&D) & Mr H M Sakariya, JE(R&D) visited the function of Laxchandi Mahaygna at Unjha and also prepared various Demo Models such as Watchdog Transformer, Metering Console, SKY Model etc at the Energy Pavilion as representatives of EPD, GoG.
10. On December 23, 2019, Mr D R Shah, I/c EE(R&D) & Mr S P Rathod, JE(R&D) & Mr H M Sakariya, JE(R&D) visited Rajnagar AG SKY feeder, MGVCCL for Proto Design on the improvement of CUF by water piping fixture arrangement on SKY Panel and visited Rotosol Inverter Manufacturer at GIDC, Vitthal Udhyognagar for the observation and analysis of Inverter testing facilities.
11. On January 02, 2020, Ms Prisca Methew, Hon’ble Deputy Secretary, Department of Administrative Reforms & Public Grievances, Ministry of Personnel, Public Grievances & Pensions, Govt. of India visited GPRD Cell for the verification of the GeoUrja project as “GeoUrja – A GIS Solution for Decision Support System and Improve Consumer Services of Power Sector” under e-Governance (NAeG) Award 2019-20.
12. On January 7, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited RSO, UGVCL, Mehsana for POC testing to the tender of PiC type earthing for SKY feeder of UGVCL.
13. On January 8, 2020, Mr J H Borisagar, DE(R&D) visited at Baroda for ERDA testing work.
14. On January 9, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited Zodiac Energy Ltd., Ahmedabad for a discussion on a solution to resolve the issues of Low CUF.
15. On January 10, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited M/s. Powertrac Industries, Limbdi for inspection of various inventory to the Common Earthing for HT lines.
16. On January 15, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited the Kadi-1 subdivision of UGVCL for inspection work of the Common Earthing for HT lines.
17. On January 18-19, 2020, Mr J B Upadhyay, EE(R&D), Mr R D Patel, I/c EE(R&D), Mr J H Borisagar, DE(R&D), Mr S P Rathod, JE(R&D) & Mr H M Sakariya, JE(R&D) participated the exhibition of Elecrama, At Greater Noida.
18. On January 20-21, 2020, Behalf of GPRD Cell, Mr J B Upadhyay, EE(R&D), Mr R D Patel, I/c EE(R&D), Mr S. P. Rathod, JE(R&D) & Mr H M Sakariya, JE(R&D) visited at Punjab State Power Corporation Limited (PSPCL), Patiala, Punjab and reciprocated the activities of Energy Sector.
19. On January 21, 2020, Mr J H Borisagar, DE(R&D) visited at Sanand subdivision under UGVCL for the surveillance under the project work of Remotely Operable and Communicable Load Break Switch with Earth Blade Facility
20. On January 24, 2020, Mr J H Borisagar, DE(R&D) visited at HKRP, Ahmedabad for the finalization

of the designing work of Smart Distribution Box under the project of Loss Reduction activity.

21. This Cell is guided through a different Committee comprising of three layers of authenticities like GC, TC and EC. On January 27, 2020, the 6th TCM was held for the review, suggestions & approval of the R & D Projects.
22. On January 28, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited the Chemical Lab of Gandhinagar Thermal Power Station, GSECL for the Coal GCV Project.
23. On January 29-30, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited at Shreenath Smart Tech Agency, Pune for the development testing of a high-efficiency inverter of Micro Wind Rooftop installation.
24. On January 31, 2020, Mr Ajay R Vakhariya, Executive Engineer, GPRD Cell, retired due to age limit. He will always be remembered for his accomplishments, years of hard work and dedication to R&D team. Mr Ajay R Vakhariya, Executive Engineer was honored by Shri R B Patel, Head, GPRD Cell and wished him healthy, wealthy and happiness full retirement.
25. On February 1, 2020, Mr J H Borisagar, DE(R&D) visited at Sanand-1 & Sanand-2 subdivision under UGVCL for the survey of the Loss Reduction Project's site.
26. On February 3, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) and Mr U N Joshi, JE(IT) visited the Sabarmati Circle Office of UGVCL for a Pre-Bid Meeting of the interested bidders for LoRa WAN Tender.
27. On February 4, 2020, Mr J H Borisagar, DE(R&D) visited at M/s Vidhya Electrical Gandhinagar for testing of Smart Distribution Box under the Loss Reduction Project's site.
28. On February 5, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) guided engineers of PGVCL at GEKC, Junagadh on "Maintenance-free, Ready Capsule, Pipe-in-Cage (PiC) type Earthing" with playing Key Role as Speaker on two-way communication of Question-Answer.
29. On February 6, 2020, Mr J H Borisagar, DE(R&D) visited Kalol-1 subdivision under UGVCL for checking the performance of the ABEB Switch installed under Kalol subdivision.
30. On February 7, 2020, Mr S P Rathod, JE(R&D) & Mr H M Sakariya, JE(R&D) given a presentation on "IoT Based Monitoring and Controlling of Distribution Solar Energy Resources with Grid Support Through SKY" for the nomination to Award Category "Smart Technology – Electrical Distribution" at ISGF, New Delhi.
31. On February 10, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited at Ozarala subdivision under MGVCL for Identifying various causes of low CUF on SKY feeder and measuring the PR of various Consumers of SKY feeders.
32. On February 11, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) have meet VP-JIO (Reliance) for exploring the feasibility of NB-IoT Technology proposed by JIO for the Remote Metering Application of GPRD Cell.
33. On February 13, 2020, Mr J H Borisagar, DE(R&D) visited at M/s Vidhya Electrical, Gandhinagar for testing of Smart Distribution Box under the Loss Reduction Project.
34. On February 14, 2020, Mr H M Sakariya, JE(R&D) visited the Vadod JGY feeder of Vinchhiya under PGVCL for the inspection work of Common Earthing for HT lines.
35. On February 20, 2020, Mr J H Borisagar, DE(R&D) and M A Vhora, SA(IT) organized the workshop on "GeoUrja" at Mehsana for the training to the engineers of UGVCL with playing

a Key Role as Speaker on two-way Communication of Question-Answer.

36. On March 3, 2020, Mr J H Borisagar, DE(R&D) visited at Dhandhuka subdivision under UGVCL for the inspection of the Smart MCCB project.
37. On March 03, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited at Petlad subdivision under MGVL for Identifying various causes of low CUF on SKY feeder and measuring the PR of various Consumers of SKY feeders.
38. On March 9, 2020, Mr J H Borisagar, DE(R&D) attended the meeting at Rajkot for the installation & performance checking of Low Tension Distribution Box (LTDB) and designing finalization of the Conductor String Devise project.
39. On March 12, 2020, Mr H M Sakariya, JE(R&D) visited at Dahod subdivision & Halol subdivision under MGVL for Identifying various causes of low CUF on SKY feeder and measuring the PR of various Consumers of SKY feeders.
40. On March 13, 2020, Mr D R Shah, I/c EE (R&D) & Mr H M Sakariya, JE(R&D) visited at Chhani subdivision & Sankheda subdivision under MGVL for Identifying various causes of low CUF on SKY feeder and measuring the PR of various Consumers of SKY feeders.
41. On March 13, 2020, Mr J H Borisagar, DE(R&D) visited at Topline Switchgear, Santej, Ahmedabad for the inspection of ABEB Proto.
42. On March 16, 2020, Mr S. P. Rathod, JE(R&D) & Mr H M Sakariya, JE(R&D) visited Kudas subdivision under UGVCL for the testing activity on Transformer Center for the Harmonics and Unbalanced load.
43. On March 19, 2020, Mr H M Sakariya, JE(R&D) visited at Jasdan subdivision & Paliyad subdivision under PGVL for identifying various causes of low CUF on SKY feeder and measuring the PR of various Consumers of SKY feeder.
44. This Cell is guided through a different Committee comprising of three layers of authenticities like GC, TC and EC. On May 29, 2020, the 7th TCM was held for the review, suggestions & approval of the R & D Projects.
45. On June 27, 2020, Mr J H Borisagar, DE(R&D) attended the webinar on “Importance of GIS in Electric Network System” at Vishvakarma Government Engineering College, GTU, Ahmedabad with playing the Key Role as Speaker on two-way Communication of Question-Answer.
46. On June 29, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited the Vadi-Bhesrot AG feeder of Ukai subdivision of Vyara division under DGVCL for reviewing the project progress of Common Earthing for a group of Poles Project.
47. On June 30, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) visited the Ukai plant, GSECL to check their issues with earthing in the power plant and also delivered their inputs to resolve the aforesaid issues.
48. On June 30, 2020, Mr J H Borisagar, DE(R&D) visited at Topline Switchgear, Santej, Ahmedabad for the new designing work of SLDO Fuse Link and for preparing the video of SLDO installation guideline.
49. On July 2, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) & U N Joshi, JE(IT) visited the Ladol subdivision for setting up the field level PoC requirement in the Agriculture

field.

50. On July 3, 2020, Mr D R Shah, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) & U N Joshi, JE(IT) visited the Hi-tech Lab, Sabarmati for performing PoC of LoRa WAN of the participated bidder.
51. On July 3, 2020, Mr D R Shah, I/c EE(R&D) & Mr H.M.Sakariya, JE(R&D) & Mr U N Joshi, JE(IT) visited the Ladol subdivision under UGVCL for checking the on-field feasibility of LoRa WAN technology of the participated bidders.
52. On July 6, 2020, Mr K J Solanki, SA(R&D) visited at Sabarmati, Circle Office, UGVCL for GPRD Cell's expenditure & audit and tenderization work for ongoing projects.
53. On July 07-08, 2020, Mr J H Borisagar, DE(R&D) visited at M/s Vidhya Electrical, Gandhinagar for testing of Smart Distribution Box under the Loss Reduction Project.
54. On July 20, 2020, Mr J H Borisagar, DE(R&D) visited at Shilaj, Ahmedabad for explaining the function of ABEBE project to the line staff of Shilaj subdivision under UGVCL.
55. On July 20, 2020, Mr R D Patel, I/c EE(R&D) & Mr H M Sakariya, JE(R&D) & U N Joshi, JE(IT) visited Shreenath Smart Technology, Ahmedabad for checking of performance of Li-Ion Battery Based Power Bank for GPRD Server Power back up purpose.
56. On August 06, 2020, Ms Alka Yadav, Director, GETRI, Baroda met Mr R B Patel, the then I/c CE, GUVNL, Baroda & Head, GPRD Cell, Gandhinagar to receive information and get aware about the activities of the GPRD Cell.
57. On August 11, 2020, Mr J H Borisagar, DE(R&D) visited at EMC, UGVCL, Gandhinagar for the regular inspection work of Micro Inventor Solar Project.
58. On August 13-14, 2020, Mr K J Solanki, SA(R&D) visited at Circle Office, PGVCL, Junagarh for GPRD Cell's expenditure & audit work.
59. On August 14, 2020, Mr J H Borisagar, DE(R&D) visited at Topline Switchgear, Santej for the inspection of the Mechanism of ABEBE switch supply to UGVCL, PGVCL & GPRD.
60. On August 27, 2020, Mr J H Borisagar, DE(R&D) visited at Kudasan subdivision for the checking of redesigning the transformer structure's condition that was installed before two and half years at Kudasan subdivision's area.
61. On September 2, 2020, Mr K J Solanki, SA(R&D) visited at UGVCL, Circle Office and UGVCL, Regd & Co. Mehsana for GPRD Cell's expenditure and audit work.
62. On September 9, 2020, Mr D R Shah, I/c EE(R&D), Mr H M Sakariya, JE(R&D), U N Joshi, JE(IT) and Mr K J Solanki, SA(R&D) visited at Godhara division Office, MGVCL, for LoraWan project related work
63. On September 11, 2020, Mr J H Borisagar, DE(R&D) visited at M/s Vidhya Electrical, Gandhinagar for the designing work of Smart Distribution Box and Transformer related Loss Reduction Project with Mr G H Engineer, ACE & H. D. Chaudhary, DE, both from R&C Office UGVCL, Mehsana.
64. On September 18, 2020, Mr J H Borisagar, DE(R&D) visited at Adalaj subdivision under UGVCL for the sample survey of the Loss Reduction Project.



3



4

**Continuing Professional Development Program
Cyber Security & Forensic Investigation Tools & Techniques
25 - 29 November, 2019 at ESCI Campus Hyderabad**
Organised By : IT - Division, Engineering Staff College of India, Hyderabad, TS



5



6



9



6



11

Ms. Prisca Methew, Hon'ble DS, Govt. of India visited GPRD Cell for GeoUrja Project under e-Governance (NAeG) Award 2019-20



17



23



24



31



47



37



46



39



47



56

PROUD MOMENTS...!

■ SHRI MAHESH SINGH, HON'BLE MD, UGVCL INAUGURATED OLTS VAN

Dr. Mahesh Singh, Hon'ble MD, UGVCL inaugurated "On Line Testing Setup (OLTS)" on November 11, 2020, one of the distinct products - designed and developed by Gujarat Power Research and Development Cell, GUVNL, Gandhinagar. The proud moments were held at Hi-Tech meter testing laboratory, Circle Office, UGVCL, Sabarmati, in presence of the CEI Shri H. H. Khoja and the senior Engineers of the UGVCL and GPRD.



The GPRD team, jointly with the lab experts of the UGVCL and MGVCL, tested the OLTS successfully at one of the HT consumer installations at Savli GIDC, Vadodara. The OLTS Van has been designed & developed for all four DISCOMs of the Power sector of Gujarat state.

As we know that the HT Consumers are the prime consumers for our DISCOMs, as around 60% of revenue is contributed by these consumers. As being a highly revenue oriented stakeholder of the company, it is very important to keep the energy measuring components of an HT installation i.e. the CTPT unit, TVM, control cable etc., very accurate. Normally, the cross verification of the accuracy of a TVM is done periodically at the site by DISCOMs at actual factory loading with the help of the standard meters, available with the DISCOMs. The DISCOMs have limitations for cross verification of the accuracy of CTPT unit, Cable, TTB etc. at the site as the instrument for the same are not available with DISCOMs and as a result, the accuracy of CTPT units could never be verified at an actual factory loading. Due to this limitation, the accuracy of the CTPT unit remains always unknown when it is replaced either due to a change in demand or when it fails. If this limitation is overcome by way of any innovative concept, huge revenue leakage would be stopped.

The GPRD took this task as a challenge and ultimately after a hard work of around one year, OLTS has been developed and tested successfully.

The first OLTS has been issued to Hi-Tech Meter testing laboratory, UGVCL, Sabarmati in presence of Hon'ble Managing Director, Dr. Mahesh Singh, IFS on November 11, 2020. (Photograph above)

It is envisaged that the OLTS will prove as a key equipment for the UGVCL to prevent revenue leakage due to errors in CTPT unit. After the successful results of this demo piece, three more OLTS will be procured for the remaining three Discoms.

GUJARAT POWER RESEARCH & DEVELOPMENT CELL



(A Government of Gujarat Initiative)
Gujarat Urja Vikas Nigam Ltd
IIT Gandhinagar Research Park
Academic Block 3, Room No. 214
IIT Gandhinagar, At. Po : Palaj-382355
Dist. Gandhinagar, Gujarat, India



Your views are important for us, we are here

