



## REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR

**An Article By Mr. JH Borisagar**

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### WE, THE GPRD CELL

Gujarat Power Research & Development (GPRD) Cell is a research center established by the Government of Gujarat for Gujarat Urja Vikas Nigam Limited (GUVNL) and its subsidiary Companies namely GSECL, GETCO, DGVCL, MGVCL, PGVCL and UGVCL. GPRD Cell is working under Gujarat Urja Vikas Ltd (GUVNL) and is funded by the Government of Gujarat through GUVNL.

The success of the leading companies depends on the strength of their efforts employed towards R&D. Such Companies spare and spend a huge amount of funds and manpower for R&D activities. With this concept and considering the future requirements of the Power Sector of Gujarat, an independent R&D Cell, called GPRD Cell has been established.

### ABOUT THE PRODUCT - REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH

### EARTHING FACILITY AND FAULT PASSAGE INDICATOR

This article is regarding the development of equipment which helps us towards the difficulties faced by Utilities during Electrical Maintenance Work.

We know that at the time of Electrical Maintenance Work, it is experienced that “If we will not earth the line, the line will earth us”

As we know that the most concern issue for any of the DISCOMs is “The Earthing of the Line or Section”. Specifically, when the repairing or maintenance works are going on. It is very well known that as and when it is required to work on any electric line, as a part of standard safety protocol, it is a technical requirement to earth the line solidly at both sides of the working place.

Looking to the high level requirement of quality earthing to earth isolated line solidly at the time of repairing or maintenance works, the GPRD team

has taken up the research project to address the difficulties faced by the DISCOMs by developing **“REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR”**.

### **PRESENT PRACTICE**

During the 11KV line maintenance or rectification work, it is mandatory to do all line conductor earthing at both the side of the workplace. But, It has been seen many times, that due to overconfidence, unnecessary hurry, or laziness, our technical staff does not take care of such an important and essential task during maintenance works and start working on a floating line which results in a high no. of fatal/non-fatal human accidents. When such kinds of incidents occur, ultimately the organization or company and the victims and their family members have to suffer the most from such types of irrecoverable damage. Hence working on any isolated / unearthed line is nothing less than playing with the lives only. From Top Management to Subdivision level, it is continuously tried for educating the line staff to ensure proper earthing of the working section before starting the work. But, it has been seen that the results achieved by us are not satisfactory. There might be so many technical as well as non-technical reasons

### **LIMITATION OF PRESENT PRACTISE**

we know that Power reliability and safety in the Power Distribution System is a big issue for every distribution utility in India. The distribution of Power supply networks is the most complex one in itself. The Feeders or Lines are laid in parallel configurations. But the physical lines cross the other at many locations.

Despite this, there are various factors, when the duration of the fault restoration time increase respectively chances of an accident of line staff also increase, which cause the poor Power reliability for the Consumers and accident of the line staff. This causes huge commercial loss and manpower loss to the utility and ultimately the utilities have to bear huge revenue loss.

Due to parallel runs or crossings, EMF (Voltage) induces in each other (due to induction effect), and also sometimes due to low clearances, they may touch each other when the conductor swings. Also, there are possibilities of back charging the line by any outsider because of the usage of generators in line without change over switch. Under these circumstances, the line gets charged though, it is isolated from the source, as it is floating (means, unearthed), it results in fatal/nonfatal accidents. Hence, it is very dangerous to work in such an unearthed condition.

While working, if any isolated unearthed line touches any live line or vice versa, the isolated line gets fully charged and the person working on the isolated line may get severe burns (Only burns or a non-fatal accident like fall from the line, or maybe fatal). In such situations, the live line does not trip immediately, due to a high resistance human body path. If such an isolated line is earthed properly, then the live line will get tripped immediately and the person working on lone will not get a heavy electric shock and may probably not meet with an accident.

**ABOUT “REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY**

## AND FAULT PASSAGE INDICATOR”

The innovative Medium voltage “**REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR**” design is divided into four different parts, which are known as (1) Remotely operable and communicable AB Switch with Earth Blade, (2) Data Concentrate Unit (DCU), (3) FPI to Identify the faulty portion & (4) Mobile Application/Desktop Application.

The “**REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR**” switch is remotely operable through the mobile application by SMS based and web base as per the GSM/GPRS communication. The switch is integrated with Line FPI [Fault Passage Indicator] to identify the fault location for immediate action of Power restoration.

## FUNCTIONS OF THE FOUR DIFFERENT PARTS OF REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR

### (1) REMOTELY OPERABLE AND COMMUNICABLE AB SWITCH WITH



### EARTH BLADE

The outdoor type 11KV, 600 Amp AB Switch shall be operated in ‘off/On’ load condition. It is a change over type switch. One side of the

blade is connected to the live line side and the other side when operated is connected to the earthing side. It adopts a mechanism for operating to isolate the feeder or a part of the feeder. AB switch is consists of the polymeric insulator with proper creepage. The insulator has a dry frequency high voltage withstanding capacity, minimum up to 28 KV.

The device design is having a self-locking mechanism of not connecting the main blade with earthing, when it is charged, which means when the switch is in ‘ON’ condition, Hence, in no case, the live line shall be earthed, even accidentally as per Fig 1. The Earth blade shall be operable only in ‘OFF’ condition of the switch. On the earth side of the switch, the deadline shall get solidly earthed that too dead short of all the three phases as per fig .3.

### (2) DATA CONCENTRATE UNIT (DCU)

The DCU should be able to store the date and time stamping of all events from communicable switches & FPI and send all the requisite events to the Mobile/Desktop Application through the server. This DCU should have the facility to change the FPI setting over the remote operation. This DCU should have the memory capacity to store the last 100 stamped events or it depends on the

capacity of the DCU. The DCU should enable the communication on one side with the FPI units, via a spread spectrum license-free radiofrequency, with low Power consumption and the server side with the distant acquisition system through a long range communication medium over a

mobile telephone network (GPRS/GSM) or upgraded version). Data can also be collected through RS 232 port at site. The software has also the capability of full diagnostic. It should

be possible to configure these parameters from a remote control centre over the GPRS/GSM network. Suitably, an external Power supply with a battery backup arrangement for a data concentrator and GPRS/GSM MODEM can also be provided through the nearby LT line/PT/Solar panel. The communication network (BSNL, Vodafone, Airtel, Jio etc.) can be selected as per the on site network strength, The battery backup duration for the DCU to run without AC supply should be of minimum 4hrs/20 nos. of operations.

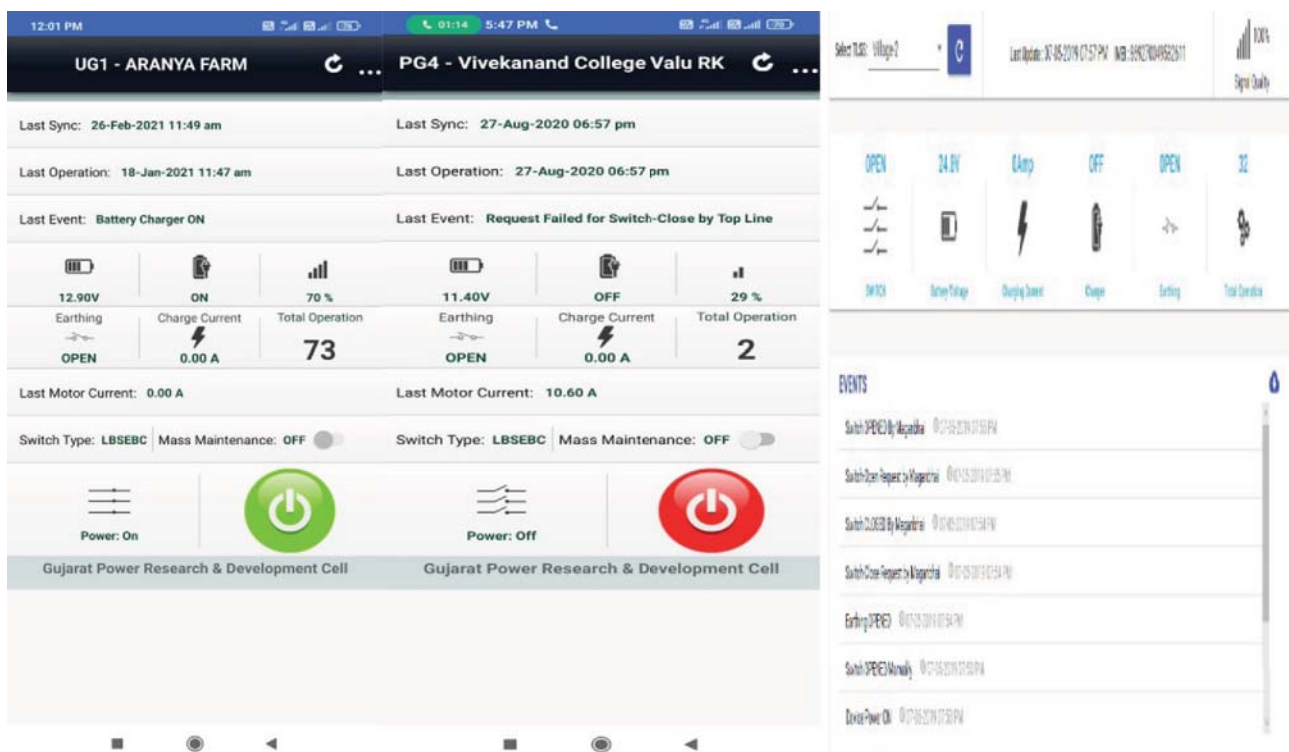
### (3) FPI TO IDENTIFY THE FAULTY PORTION

The Fault Passage Indicator shall be clipped on the overhead 11 KV line conductor. The device shall be clipped on each phase to measure current and voltage presence in this phase and then it is computed for the fault detection algorithm, accordingly. This device allows remotely monitor the appearing of faults on an overhead high voltage network, to locate faulty sections and to depute the staff on patrols at a precise location; for rectification of the network,

accordingly. The FPI shall indicate both, transients as well as permanent faults on the O/H lines.. The FPI shall be capable of at least 150 Mtr short range radio communication interface with the DCU.

### (4) MOBILE APPLICATION / DESKTOP APPLICATION

Mobile application and desktop application are connected with the server. Before starting any operation, the server should be cross verify about the user authorization. The switch is operated through a mobile application using GPRS/GSM based communication with the server. The server is communicated with the DCU for FPI and Switch. If any fault occurs in the line, various FPIs of the Feeder are giving data to the server and after this server identifies the faulty location and gives the idea about, which switch is preferable for operation. Also, the safety point of, switch operation lock is provided in the application for the mass maintenance activity and the acknowledgment received after the operation complete or not complete.

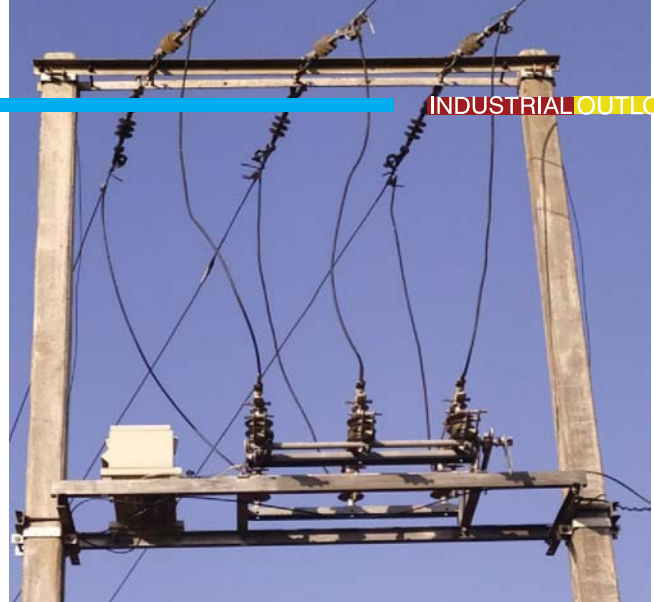


### STRATEGIC ABILITY

- When compared with the existing available air break switch has no provision for the remote operation and earthing facility, the ABEB has provision for the remote operation and earthing facility.
- In the market, RMU, Sectionalizer, Auto Recloser are available but the purchase and maintenance cost of the equipment is very high and periodically more maintenance requires due to more SF6 gas leakage incidents. The ABEB requires minimum maintenance and the cost of the equipment is also less.
- The skilled manpower is required for the operation and all work carried out by ground staff only.
- Some of the equipment has no earthing and FPI facilities. ABEB has both facilities as earthing and FPI.
- For the remotely operation huge infrastructure is require (e.g. SCADA). In ABEB, no external staff and infrastructure are required.
- All are working through GPRS/IoT based communication but in some rural areas, internet availability is less so it's directly affects the operation of the equipment. ABEB working in both GSM/GPRS technology.

### SOUNDLESS NATURES

- Minimization of the fault restoration time
- Improve the Power supply reliability
- Easily identify the fault area location
- The electrical accidents to utility staff shall get eliminated almost
- Increase the customers' satisfaction
- No need SCADA Control Room and accordingly staff set up.
- A Cost Effective Solution
- Life of Substation end breaker increase
- Identify the areas requiring maintenance, precisely.
- Increase in the confidence of the utility working staff
- Increase in ease and safety of the operation
- Address the back Power issues of distributed generation
- Communication with both the facility (SMS/GPRS)



### CONCLUSION

The Urban/Rural, both, areas are always challenging for any DISCOMs as Power reliability and Line staff safety point of view. As the areas are scattered over the wide area and other obstructions, technology such as ABEB can be very useful. Also, in the cases of Fatal and Non-Fatal accidents, ABEB is very helpful to prevent that kind of accident. For Power reliability and safety, the technological transition from conventional To automation is the need of time. By viewing these reasons, ABEB becomes economically and technologically quite a viable option for Power reliability and safety.

### FIELD STUDY REPORT

Total 33 "REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR" switches have been successfully installed, commissioned, and being monitored through a responsive platform at different places of DISCOMs. All are found working satisfactorily since, more than 3 years. Field Engineers and technical staff have been giving very good reviews for the "REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR".

### PATENT DETAIL

The GPRD Cell has registered a Patent application of REMOTELY COMMUNICABLE AND OPERABLE AIR BREAK SWITCH ASSEMBLY WITH EARTHING FACILITY AND FAULT PASSAGE INDICATOR vide IPA no. 201821017183 at the Patent Office of the Government of India. ●●●

For more details, please contact us without any hesitation, we are at [www.gprd.in](http://www.gprd.in)