



INNOVATION STRATEGY CLOSE-OUT REPORT

PROJECT TITLE	Innovative LV Auto-Reclosing on Intermittent Faults to Reduce Customer Outages
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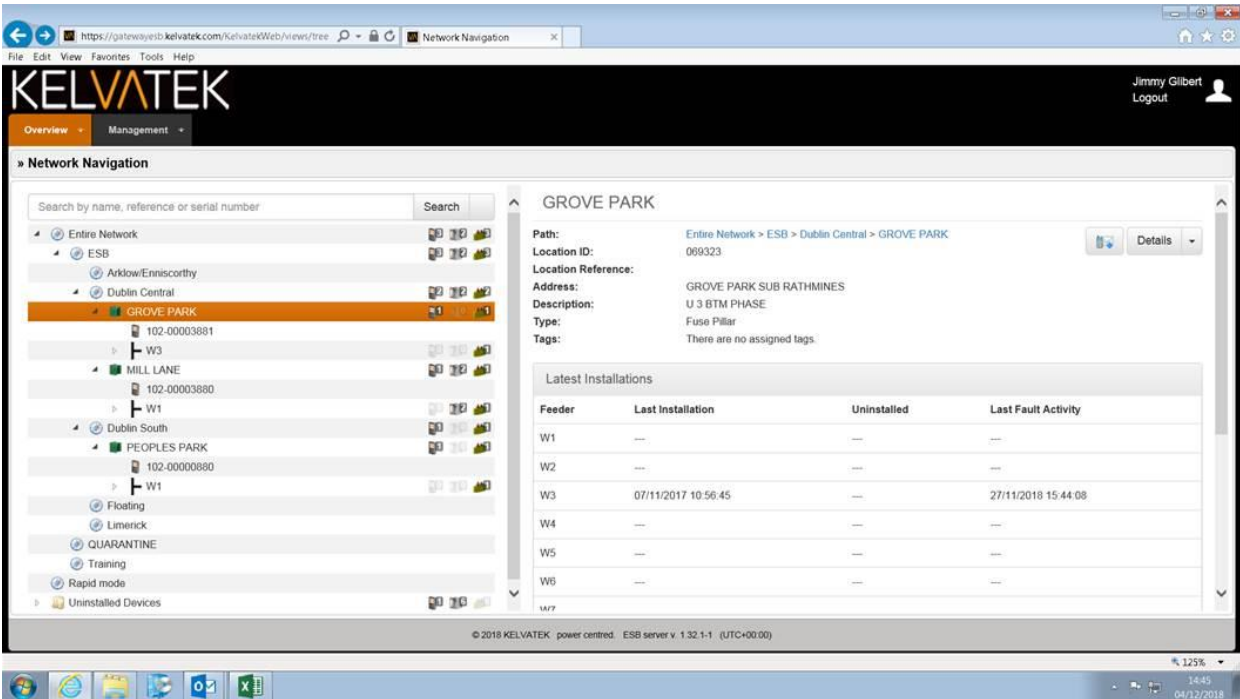
BRIEF OVERVIEW OF PROJECT & EXPECTED BENEFITS

Intermittent LV cable faults occur from time to time on underground LV underground network. Due to the nature of these faults, they have in the past proved difficult to find, as the circumstances which caused the fault to occur have corrected themselves (e.g. moisture across two cores). Then, when the circumstances reoccur the fault comes back with further loss of supply to the same affected customers.

ESB Networks planned on using the equipment from Kelvatek to improve LV performance as part of the Smart Grid MV/LV Control Operation trial, aiming to deliver improved continuity and customer satisfaction:

REZAP Modular

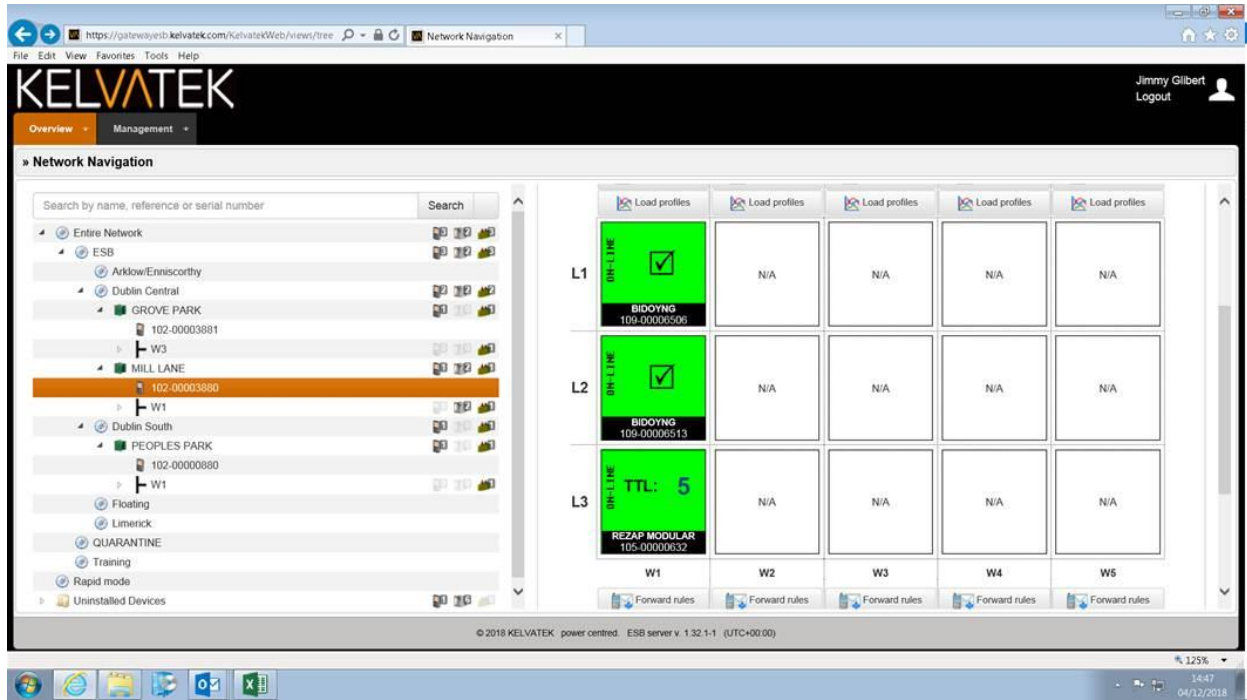
Multi-shot auto-recloser for use on LV feeders. The unit detects a fault and will reclose after a specified time period for transient faults. This can be specified with a Gateway device which monitors and uploads in real time current, voltage and transient identifiers, to a cloud platform which can be accessed online. Settings (current trip ratings etc.) can also be changed by ESB Networks staff locally or online with relevant user permissions. The unit sends a text/email message direct to devices (phone/email) of our choice if there is any fault activity.



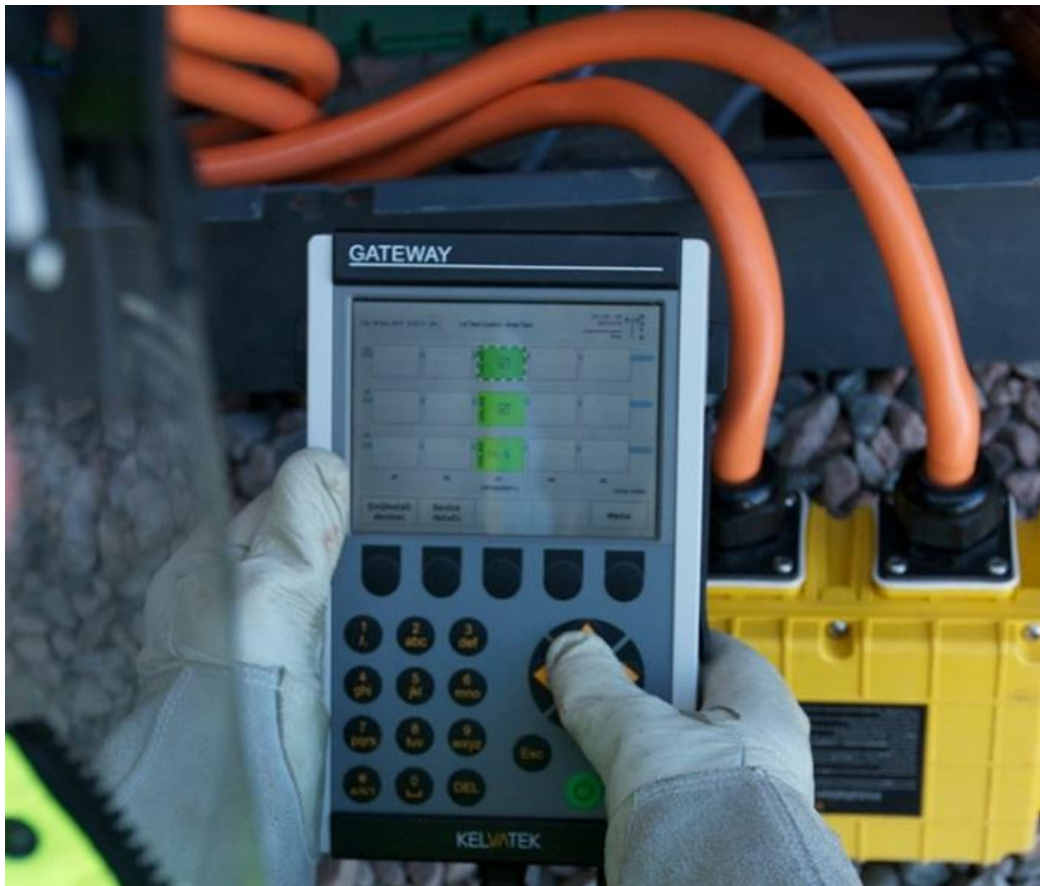
BIDOYNG

Single shot auto-recloser with two fuses for LV. This is placed on the two non-faulted phases where the REZAP Modular is placed on the faulted phase.

Web based view and control



REZAP Modular Illustration



BIDOYNG Illustration



RESULTS

The units have been deployed on appropriate LV cable faults when required and assisted with the permanent repair to the cable. Trial happened in 2016/2017.

REZAP

During trial period the first Rezap unit (REZ 105-632) was installed in Westin Hotel (substation #068245X) recording two intermittent faults (plus automatic customer supply restoration) and later was installed in Dame Lane (substation #068008X) recording one intermittent fault (plus automatic customer supply restoration).

During the trail the second Rezap unit (REZ 105-634) was installed in Bellevue Road, Greystones (substation #071160) recording 14 intermittent faults with the majority of automatic customer supply restoration. One case required site visit by Network Technician (NT) as several trips lead to lockout. Later, the second Rezap unit was installed in Ulvertown Road, Dalkey (substation #001364) recording one intermittent fault with automatic customer supply restoration, however a NT site visit was required for Bidoyng operation in order to replace the primary fuse. The customer remained online as the secondary fuse held.

BIDOYNG

During the trial period the first Bidoyng unit (BID 109-1908) was installed in Dame Lane (substation #068008X) recording two intermittent faults with one automatic customer supply restoration and the other one requiring NT site visit due to primary and secondary fuses being operated.

During the trial period the second Bidoyng unit (BID 109-2202) was installed in Dame Lane (substation #06008X) recording two intermittent faults with one automatic customer supply restoration and the

other one requiring Network Technician (NT) site visit due to primary and secondary fuses being operated.

During the trial period the third Bidoyng unit (BID 109-6446) was installed in Bellevue Road, Greystones (substation #071160) recording six intermittent faults with all but one automatic customer supply restoration and the other one requiring NT site visit due to primary and secondary fuses being operated.

During the trial period the fourth Bidoyng unit (BID 109-6469) was installed in Bellevue Road, Greystones (substation #071160) recording one intermittent fault incl. automatic customer supply restoration and later the unit was installed in Ulvertown Road, Dalkey (substation #001364) recording one intermittent fault but requiring NT site visit due to primary and secondary fuses being operated.

In addition, the trial gave ESB Networks the opportunity to learn how to install, operate and reset equipment and how to use the Kelvatek software.

LEARNINGS

The following learning was achieved during this trail

- The REZAP is both DIN and BS88 compatible. BIDOYNG units are only BS88 compatible at present.
- The REZAP and the BIDOYNG units help in preventing customer minutes lost (CML) and Customer Interruptions (CI) by automatic reclosing after an intermittent fault occurs and reduces the need for immediate NT intervention.
- The REZAP and the BIDOYNG units work best where the LV underground network is accurately recorded.
- On more complex LV underground network, the need for accurate recording is greatly increased in order to make effective use of the units.
- To achieve accurate distance to fault measurements with this equipment, the recorded LV underground network must be input into the equipment. There is a service (SAPIENT) available from Kelvatek to assist utilities with fault locations, ESB Networks would need to have a complete fully available record of the LV network in order to avail of this service.
- On several occasions, accurate measurements to fault (within one metre) were achieved, thereby reducing the cost of exploratory civil works.

BENEFITS REALISED/VALIDATED

The benefits for ESB Networks depend on several factors.

- The more LV underground network on the LV system, the greater the possibility of intermittent faults (either driven by combination of cable age and wet weather or where copper/aluminium pitting has occurred at cable joints) occurring on the LV system.
- The effect of these intermediate LV underground network faults causing interruption to customers is reduced by the use of the Rezap/Bidoyng units. This results in a reduction in CMLs/CIs.
- This trial showed the possibility of improved identification of correct fault location and the potential opportunity for repair prior to the development of a more permanent fault.

- Due to the finite amount of LV underground network and the low number of intermediate faults the cost benefit of this equipment is restricted to the large urban areas that contain significant LV underground network.
- To achieve maximum benefit, an accurate record of the LV underground network is required.

NEXT STEPS – BAU, TRANSFER OF OWNERSHIP

All three sets of units that were purchased have been transferred to the local delivery organisations in Dublin Central area (two sets) and Dublin South area (one set).

There is no intent to buy additional sets as they are currently only required in the Dublin area which is covered by the three sets purchased.

FINAL TIMELINES (REASONS FOR ANY DELAYS IF THEY OCCURRED)

Purchase of equipment (three sets) in 2016.

Trial over winter period 2016/2017 in Dublin Central and Dublin South.

Transferred to Dublin Central/Dublin South for BAU in 2017/2018.

FINAL COSTS

The capex costs for this project are commercially sensitive.

Savings during the trial are based on continuity penalty calculations and avoiding NT callouts to substations. Over the trial period for winter 2016/2017 a total of just over €9000 in avoided penalties and technician's callout charges were saved by having two sets (two Rezap and four Bidoyng) installed.