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ALARM – PHASE 1 REPORT

EXECUTIVE SUMMARY AND EMBEDDED DETAILED SLIDES

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WPD|INNOVATION

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1 Executive Summary

The project is demonstrating a technically alternative and lower cost approach to identifying the location of transient LV (pecking) faults. This is undertaken while the cable is in normal service, before they are presenting multiple fuse operations (and associated customer interruptions), and also before they have developed to a permanent fault requiring immediate location and repair. The partner for this project is Lucy Electric GridKey. The project runs from Sep 2019 – Apr 2022 with two distinct phases, and has a budget of £493k.

Phase 1 of the project has now been successfully completed, with pecking events captured on all of the 26 deployed monitors; these monitors are located in the East Midlands region. Credible locations for pecking faults are available for three sites, and validation work (originally planned for Phase 2) has just started for these sites. These indications have been discussed with the appropriate local teams. DTF indications are also emerging for around 10 further feeders, and cautious indications have been offered to local teams for some of these feeders on a "best information available" basis.

The installed monitors capture voltage and current waveforms from LV feeders when pre-set triggers are activated. The captured waveforms are then forwarded via a GPRS data connection to a data repository. The Phase One deployed equipment has successfully captured and stored thousands of events across the 26 deployed monitors, consistent with capability expectations of the Phase One installed equipment.

The captured data is processed and impedance values for the monitored network at the time of the event are estimated. The estimated values are used to establish a distance to fault (DTF) estimate for an individual event. DTF estimates are established for all events conforming to a "pecking fault" characteristic, and an overall DTF assessment for a feeder is developed from this set of individual results. The feeder DTF assessments are manually translated to network positions. 7,990 pecking events (including single phase and phase-phase events) have been analysed. 2,647 events have been found to be good quality fits compared to the expected electrical behaviour of a feeder with a pecking fault. 77% of these 2,647 events have occurred on 13 of the monitored feeders, these feeders all have 20 or more events per feeder.

Whilst the individual "fits" for events appear good, variation exists in the resulting individual DTF indications for any particular feeder. Phase 2 of the project will introduce enhanced waveform capture hardware, and the potential for reductions in the range of individual DTF results that form the feeder DTF assessment will be examined.

As would be expected from an Innovation project, learning is being accumulated. From Phase 1, this includes: improvements to the DTF analysis model based on field results; an issue has been encountered and resolved with identifying the feeder associated with each individual events; limitations in individual event understanding due to the Phase 1 data capture period (single cycle of data before and after the initiation of an event); and installation of flexi-sensors around fuse handles requires precise placement to avoid contact with potentially hot fuse bodies.

Phase One has achieved its fundamental aims of proving the data capture, collection and analysis concept, and informing the development of assessment processes that will be further tested in Phase 2 of the project, when enhanced hardware becomes available as planned.

Further details of Phase 1 of the ALARM project are presented in the attached slide pack.

ALARM Phase 1 Report v1-0.pptx