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2017 INTERNATIONAL CONFERENCE ON LIVE MAINTENANCE (ICOLIM) REPORT

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BY BOB TAYLOR

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DISCLAIMER

The views expressed in this report are those of the author's own and do not necessarily reflect the views of the Electricity Engineers' Association.

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BACKGROUND

The 2017 International Conference On Live Maintenance (ICOLIM) was held in Strasbourg from the 26th to 28th of April 2017.

As chairman of the EEA National Committee Live Work I attended on EEA's behalf and also gave a paper, titled '*When to undertake live work a New Zealand case study on a structured approach to balancing risk*'.

This Report

The following report summarises the learning from the conference and identifies some key actions that our industry should take as part of our work to improve management and standards that govern HV Live Line work in New Zealand.

As it was impossible to attend all sessions this report has been prepared based on the presentations attended.

Overview of Presentations

The following extract is a list of the sessions and web links to the articles presented.

All papers can be downloaded from the website http://www.icolim2017.org.

Session	Articles
1. Training, selection and qualification of operators	– Live Working Training Organisation in France – Live work training centres cooperation and development – Enedis Operational Training Unit
2. New working methods, new procedures and techniques	– Live Working on ACSS conductors France – Development of a live-line technology for insulator changing Hungary – New approach for Special Operating Modes at RTE
3. Standards, regulations and legal aspects	– Standards, regulations and legal aspects, Live Working and International Standards Application to Electrical Systems and Installations France – Guidelines for selecting PPE against arc thermal hazards – the new edition of DGUV-I 203-077 Germany – Coordination of PPE and fuse links for personal protection against arc thermal hazards in LV systems Germany – Comparative analysis of CEI/IEC 60900 insulated tools and its hybrid equivalent, used in Live Working low voltage methods

Session	Articles
4. New working methods, new procedures and techniques	– Live Line Inspections with Drone Technology Portugal – Live high voltage maintenance with helicopter and human external cargo France – Overhead Power line stringing with UAV Portugal – Experimenting the use of drones for MV LW
5. Training selection and qualification of operators	– Live Work Training and Skills development at RTE France – Live Working Training Program in UTE-Distribution Uruguay – Organisation of LW at Enedis - Management of Professionalism of LV and MW LW operators France
6. Construction, operation, modernization and maintenance experience	– Live Operating and Efficiency of Equipment's Management Romania – A Performant Antigalloping Device or The 400 kV O/H Lines With 3 Subconductors Was Designed Tested Manufactured And Installed In Romania In 2015. Live-line Procedures Available Romania – Testing methodology of safety equipment, used in Live Working methods in Poland – New live working method to replace high voltage line tower France
7. Standards, regulations and legal aspects	– Risk parameters of DC fault arcs – research work on DC arcs in LV systems Germany – IEC and CENELEC standards used to protect the electrical worker against an Arc Flash France – ELECTRIC ARC PROTECTION: Selection of PPE - Practical experience of different arc assessment methods and their comparison Germany – Electroinsulating Footwear and Overboots for Live Working – Practical Experience and Evolution of Standards Poland
8. Economic and strategy aspects	– Live Working Method Comparisons - Rubber Glove Work vs. Hotstick Work vs. Barehand Work Canada – Low voltage live working with only one practitioner Germany – Maintenance of Complex Systems - From Preventive to Predictive: Simon Fossier - Thales Research & Technology, France

Session	Articles
	– Integration of health and safety management in the management system of the company Argentina
9. Standards, regulations and legal aspects	– Revision of the way of classification of conductive clothing Hungary – Conductive Clothing Standard Evolution and its connection with the European Directive about Electromagnetic Fields Italy – Electromagnetic Field Measurement On High Voltage Overhead Lines Romania – Handling of magnetic field-related risks during live-line maintenance Hungary
10. New tools equipment and materials	– CONNECTION DISCONNECTION ON 225Kv LINE France – New Trend on Transmission Power Lines and Related Stringing Equipment Development Italy – A comprehensive analysis of facial screens Italy – Innovative New Live Line Tool and Framing Designs Facilitating Safe and Efficient Cross-arm Replacement Canada
11. Economic and strategy aspects	– Summary of the Live Maintenance project “Prace pod napieciem 2010+” in ENEA Operator Sp. z o.o.; 2011 – 2015 Poland – Feasibility analysis and introduction of LW on the Turkish distribution grid-Challenges and opportunities Turkey – Establishment and implementation of the Live Working System in Turkey – A Feasibility Study of Live Working in Turkish Electricity Distribution System
12. Construction, operation, modernization and maintenance experience	– The best way to climb the wood poles Kai Solum - REN AS, Norway – Study on the quality management and health and safety aspects on perceived live working implementation dimensions Slovenia – Laboratory Organization according to ISO 17025 Standard for Periodical Tests of Live Line Working Equipment in Italy
13. Safety, human impact and environment	– Product Distribution and Smart Grids - Impacts on Live Working Portugal – Safety management in healthcare by means of live working Slovenia – When to undertake live work - a New Zealand case study on a structured approach to balancing risk New Zealand

Session	Articles
14. New tools equipment and materials	– New low-voltage tools France – DEVELOPMENT OF NEW TOOLS Argentina – Displacement and support of medium voltage conductors by means of loader cranes France

HISTORY OF LIVE WORKING

As part of the opening sessions an overview of the history and current state of Live Work in France, Italy and Portugal was given by various presenters.

France

Live working is supervised by the Ministry of Labour and the Ministry of Industry.

In the early sixties, both Ministries together with transmission and distribution supply operators created a "Live Working Committee" This committee has responsibility for live work regulation and is in charge of defining work methods, tools and training programs.

There are more than 30,000 workers who undertake around 3,000,000 live work tasks on Low Voltage distribution networks, and 1,000 workers who undertake around 50,000 HV live work tasks each year.

Priority is placed on ensuring training is organised and controlled to deliver high health and safety standards. The Live Working Committee has defined a specific protocol to certify training companies with the use of information seminars, annual reports and audits.

Italy

There are two electricity operators in Italy, Enel and Terna.

- Enel is a multinational manufacturer and distributor of electricity and gas; and
- Terna Rete Italia is an electricity transmission system operator. Terna is the first independent electricity transmission grid operator in Europe and the sixth in the world, based on the size of its electrical grid.

Live work in Italy is a widespread. There are over 250 live line workers and over 2500 jobs undertaken per year by ENEL and TERNA. (Caution the number of workers may be for transmission alone).

Live work has been undertaken since the 1980, this is more recent when compared with other European countries. Laws enacted in 1955 prohibited any live work activity; these remained in force until 1980.

In 1980 ENEL was authorised by ministerial order to effect live work on installations above 30Kv.

In 1990 a further ministerial order extended the authority to undertake live work from 1kV to 30kV.

In 1999 TERNA (established in 1990 as a result of industry separation of distribution and transmission) set about further development of live working methods above 30kV.

Portugal

Until 1976, the Portuguese electrical sector was fragmented into several companies operating at regional level. Electricidade de Portugal (EDP) was created in 1976 with the merger of 13 nationalised companies. Several development programs were undertaken at this time, including the complete electrification of Portugal. This restructure of the industry revealed the need to adopt techniques that enabled network work methods that provided continuity of electricity supply.

The first steps towards Live Working (LW) were undertaken with Électricité de France (EDF / SERECT) in the acquisition of methods and tools, as well as team training. The continuous growth of LW activity led EDP to adopt new methods (rubber gloves and bare hands) with SERECT supervision, to advance from LV (Low Voltage) and MV (Medium Voltage) to HV (High Voltage – 60 kV), and to train and contract teams from outsourcing companies.

At first training was assured by EDP. However, the requirement for training quickly grew and EDP adopted a policy of outsourcing the training, while maintaining its own technology and methods. To ensure the quality in training and to guarantee high performance of external teams, EDP implemented monitoring and auditing methods in LW and training activities.

KEY LEARNING

This section provides a summary of key learning from the sessions attended.

This report does not cover specific information on new technology, tooling or procedures, if interested this information can be reviewed on the ICOLIM web site.

In Europe there is centralised control of regulations, work methods, training, auditing and approval of tools. This approach reinforces the need for a more centralised approach in New Zealand specifically governing:

- Criteria for selection of work method
- The control of HV Live line work
- Standardisation of training and assessment
- Auditing
- Live Line work procedures.

Like New Zealand HV Live Line work has been practiced from the 1950's.

There is an increasing demand for HV Live Line work methods in Europe. New Zealand must anticipate a similar increase in demand for live work, as networks become active distribution systems with new technology integration on the system and customer expectations.

Of note there is a low incidence of reported serious harm/fatality over the past 5 years. (0 MV and 5 LV). It was not clear if this was just within France or across ICOLIM member companies. This is attributed to the high standards of professionalism required from live work practisioners and the centralised control of live work.

Similar challenges exist in Europe to maintain competence of live line workers. The main reason for the reducing demand in Europe is underground conversion of electricity network lines. In response there is a focus on reducing the number of live line teams to ensure work levels and practice can be maintained.

While in New Zealand the falling demand has been driven by the new Health and Safety at Work Act, that has challenged the justification for HV Live LIne work, we are facing a similar dilemma. New Zealand's situation has been compounded by the high number of HV Live Line trained staff (who have in recent years expected to be trained in HV Live Line work as a right of passage after gaining certification as Line Mechanics).

The solution like Europe has to be to reduce the number of HV Live Line practisioners and to apply higher levels of competency/professionalism to the selection of employees promoted into HV Live Line work.

Most live works carried out on distribution overhead lines require the displacement and support of conductors by means of the assembly of hot sticks, or the jib of an aerial lift with insulating boom, or suspension pullers, or tension pullers. In order to ensure safe operations, it is essential to be able to assess the conductor stress and the loads on the tools and to verify that they do not exceed prescribed limits. SERECT (Design, Execution and Experimentation Section of the Live Working Committee) has developed ECART, a calculation program now released as a JAVA application for Windows and available in several languages. The benefit of this tool has application in New Zealand and is worth further investigation.

Currently, regulations governing protection of employees from Arc Flash are not harmonized, and there are significant differences between regulations in place in France, Europe and the rest of the world.

Despite the lack of harmonisation there are three basic principles applied to protect people from electric hazards (electric shock and short circuit).

If significant risk exists from arc flash exposure, then appropriate measures must be taken with the use of specific equipment protecting against the arc flash hazard. One of the reference standards in the risk analysis field is IEEE 1584 (Guide for Performing Arc-Flash Hazard Calculations). This is a standard of the Institute of Electrical and Electronics Engineers that provides a method of calculating the incident energy of arc flash event.

In Europe, as per the stipulations of European standard EN 50110-1 (Operation of electrical installations - Part 1: General requirements), the head of the electrical installation (employer) is obliged to evaluate the electric risks and define the measures for protection against the effects of the ARC FLASH.

"6.1.1 [...] Working procedures are divided into three different procedures: dead working (see 6.2), live working (see 6.3), working in the vicinity of live parts (see 6.4). All these procedures are based on the use of protective measures against electric shock and/or the effects of short-circuits and arcing.

Outside Europe, standards and practices in North America predominate with the "OSHA" (Occupational Safety and Health Administration) regulations.

They clearly stipulate that employers must protect their employees from the effects of arc flashes.

NFPA70 E standard ("Standard for Electrical Safety in The Work Place") makes it mandatory to perform a risk analysis and to use protection where required against the thermal effects of arc flashes.

Clothing and equipment used against the thermal effects of the arc must comply with the ASTM or ANSI standards.

SUMMARY OF RECOMMENDED ACTIONS

1. EEA should continue with its work to establish and develop centralised control of live work (HV and LV).
2. The industry should develop and maintain standard procedures for HV live line work.
3. High levels of professionalism should be promoted for all HV live line work.
4. Guidance on criteria for HV live work method selection should be maintained.
5. Monitoring of HV live line work must be increased by applying the current Audit Guide to ensure Industry is managing HV live line work in accordance with ECP46, the EEA ECP46 Practice Guide and other standards governing HV live work.
6. Industry needs to work closely with Connexis to ensure live work training, assessment and moderation ensures high standards of competence.
7. EEA should develop reporting to monitor activities and performance of live line work to inform the Regulator and Industry of risk and opportunity for performance improvement.