LIVE LINE WORK IN ČEZ
DISTRIBUČNÍ SLUŽBY S.R.O.

ČDS Conference, Špindlerův Mlýn April 2017

Ing. Václav Žid
LLW Specialist
CONTENTS

LLW on low voltage devices
- Provision of training.
- Implemented workflows.

HV LLW in the DTS
- Use of LLW methods during cleaning of electrical devices.

LLW on overhead HV lines – LLW team
- Implemented workflows.
- Evaluation of the HV LLW.
- Creation of new HV LLW teams.
- Demonstrations of HV LLW workflows.
OWN EMPLOYEES

- All employees participating in operation, repair or maintenance are certified for performance of LV LLW.
- They undergo training at training centres every three years including practical training (ISŠ Sokolnice, SOUE Plzeň)

EXTERNAL SUPPLIER OF ELECTRICAL WORKS

- We require performance of LV LLW.
- We require certification for performance of LV LLW.
- The advantage for suppliers is the planning of works – it is not necessary to request a shut-down on a given date.
LOW VOLTAGE LLW (UP TO 1000 V)

EXTERIOR A CABLE LINES

MOST FREQUENTLY PERFORMED WORKS

- Insulation of the lines on houses.
- Maintenance of LV boxes.
- Connection and disconnection of consumers from an existing line.
- Replacement of isolators.
CLEANING OF HV ELECTRICAL DEVICES IN THE DTS EXPANSION TO ALL REGIONS

Dry cleaning of electrical devices.

Cleaning of devices: bus-bars, isolators, switchgear, transformer, floor, ceiling, wall,

Equipment: vacuum cleaner, isolating tube including extensions, insulated gloves

Method: remote

Expansion of the performance of DTS cleaning

✓ In 2014 identification of DTS suitable for cleaning by means of the HV LLW method was done in the remaining regions, i.e. Moravia, Eastern and Central.
✓ Implementation started in 2016.
✓ Not all DTS in these regions are adapted for application of HV LLW.
APPLICATION OF THE HV LLW METHOD TO DTS CLEANING

Cleaning of DTS 2014-2016

LLW

<table>
<thead>
<tr>
<th>Region</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moravia</td>
<td>380</td>
<td>293</td>
<td>168</td>
</tr>
<tr>
<td>North</td>
<td>21</td>
<td>57</td>
<td>9</td>
</tr>
<tr>
<td>Central</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>133</td>
<td></td>
<td>103</td>
</tr>
</tbody>
</table>
ONLY OWN EMPLOYEES

- Special \textbf{n (vn / nn)} HV LLW / LV LLW team
- 12 teams (5 electricians + 1 engineer)

TRAINING

- Own training centre.
- Training every three years.
- The trainees are subjected to an Audit of HV LLW – once a year.
- Training in new workflows.
WORKFLOWS IMPLEMENTED IN THE YEARS
IMPLEMENTED BY HV LLW TEAMS

Number of workflows implemented by the LLW teams in the period 2007-2016

Note: LLW teams perform standard non-live line works, e.g. use the LLW method to disconnect the system, and subsequently replace the Section Disconnection Switch with the power off and connect the LLW line. Sometimes, they also perform operations on disconnected devices – assistance to the Networks Division, for instance, failure states.
TREND OF “TOP” HV LLW FOR THE PERIOD 2007-2016

PERFORMED BY THE HV LLW TEAMS

- Disconnection, connection or connection of lines
- Replacement of support insulator
- Maintenance of overhead line disconnectors
- Installation of covers on support insulators
- Installation and deinstallation of single pole disconnectors
- Repair of overhead line disconnectors
COMPARISON OF HV LLW INTERVENTIONS TO SCHEDULED SHUTDOWNS OF HV NA IN 2016

LLW INTERVENTIONS BY HV LLW TEAMS

Number of HV LLW team actions versus the number of planned HV shutdowns in 2016

Without use of HV LLW approx. 25% additional shutdowns would be required

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of planned HV shutdowns</th>
<th>Number of HV LLW operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moravia</td>
<td>1,961</td>
<td>618</td>
</tr>
<tr>
<td>North</td>
<td>2,289</td>
<td>462</td>
</tr>
<tr>
<td>Central</td>
<td>3,339</td>
<td>504</td>
</tr>
<tr>
<td>East</td>
<td>2,942</td>
<td>741</td>
</tr>
<tr>
<td>West</td>
<td>2,179</td>
<td>872</td>
</tr>
</tbody>
</table>

**Note:** The diagram illustrates the comparison between the number of planned HV shutdowns and the number of HV LLW operations. Without the use of HV LLW, approximately 25% additional shutdowns would be required.
The factual SAIDI situation for 2016 was 261.7 min. This is within the tolerance range of ±5% as compared to the plan. No MALUS or BONUS. **Without LLW** the value would be higher, which is in the zone above 15%. Full **MALUS** was thus applied.
RATIO OF THE LABOUR HOURS WORKED BY THE LLW TEAMS ON THE INDIVIDUAL PRODUCTS IN 2013-16

IN 2014-16 EXCLUDED ASSISTANCE FROM LLW ELECTRICIANS IN THE OPERATIONS – GRAPHICAL

Discontinuous failures
✓ Up 61% in 2015-16

Construction programme
✓ Up 39% in 2013-14
✓ Up 32% in 2014-15
✓ Up 12% in 2015-16
✓ higher requirements in the PD

Minor repairs
✓ Up 15% in 2014-15
✓ Down 22% in 2015-16

Preventive Maintenance Procedure – PMP
✓ Down 17% in 2014-15
✓ Up 25% in 2015-16
✓ According to the PMP schedule
LOCATION OF THE EXISTING HV LLW TEAMS
NEW HV LLW TEAMS – PROPOSAL

Existing HV LLW teams
New HV LLW teams

Map showing locations of existing and new HV LLW teams in the Czech Republic.
Own HV LLW polygon located at RZ Toužim. Training is done by own instructors – LLW supervisors – experienced workers, specially trained.

**Type of training**
- basic (6 weeks)
- recurrent (4 days)
- new procedures
METHODS APPLIED TO HV OVERHEAD LINES

in contact
(use of insulating gloves)

remote
(use of insulated bars)

on the potential
(bare hands)
WORKFLOWS

Disconnection, connection
Disconnection, connection of the line
Replacement of supporting, flying cable and suspension-type insulators
WORKFLOWS

Replacement of a console
WORKFLOWS

Cable repair
Installation and de-installation of a single pole disconnecting switch
WORKFLOWS

Assembly of bird protective covers
Assembly and connection of vertical section disconnecting switches.
Repair and maintenance of section disconnecting switches.
THANK YOU FOR YOUR ATTENTION

Ing. VÁCLAV ŽID

LLW Specialist
ČEZ Distribuční služby, s.r.o
Jateční 17
360 01 Karlovy Vary
Czech Republic

vaclav.zid01@cez.cz