Live Line Maintenance in Utilities

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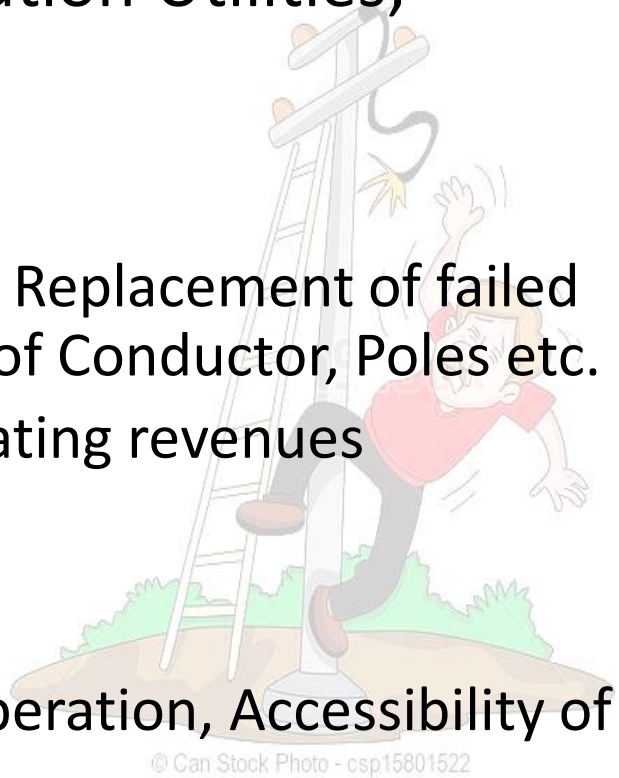
Introduction

- Live Line Mtc.- Power Transmission Utilities- Distribution Utilities;

  Indian Scenario

- Why?
  - Power outage restrictions/ regulations, Maintenance like Replacement of failed H/w fittings, Insulators, Jumpers, Repair & Replacement of Conductor, Poles etc.
  - Objectives; System integrity, System reliability, and Operating revenues

- Issues?
  - Cost- benefits, Adaptability to the technology, Ease of operation, Accessibility of Road/ spaces for such HL Mtc.



Context

- Sometimes it is necessary to maintain or repair circuits while they are in operation to avoid big failure, to improve reliability…
- HL Mtc., a comprehensive solution, makes it possible to attend/ repair charged equipment/ network (which may otherwise cause shock/ accident because of discharge or arc while doing such repairs even through insulating rod, rubber hand glove etc.)

Relevance

- Precious Resources; Time, Revenue & Losses, Equipment
- To Improve; Life of Equipment, Reliability & Safety of Network, Manpower utilization
- To Achieve; Uninterrupted Power Supply, Reliable Operation, Fast Fault Rectification, Optimization of Manpower
- To Avoid; Emergency Shutdowns, Unplanned Outages, Hazardous situations, Damages to Equipment, Regulatory Penalties, Breakdown Expenses.

Relevance

Major benefits of live-line mtc.:

- ✓Greater flexibility of maintenance management
- ✓Uninterrupted and timely maintenance
- ✓Increase in reliability & efficiency of the system
- ✓Reduction in operating and maintenance costs
- ✓Increased safety
- ✓Continuity of services to customers
- ✓Reduced planned outages for maintenance
- ✓Escape from regulatory penalty
- ✓Early attention to system problems

Presentation on the Topic

- **What can be done:**
  - ➢ Maintenance like Replacement of failed H/w fittings, Insulators, Jumpers, on-load tightening of clamps and connectors, strengthening of dead-end joints etc.
  - ➢ Hotline Testing of Assets; PID (Insulators), CTs, LAs, Breakers etc.
  - ➢ Condition monitoring
  - ➢ Repair & Replacement of Conductor, Poles etc.
  - ➢ Tree Trimming to avoid prospective breakdowns
  - ➢ New Extensions/ Installations

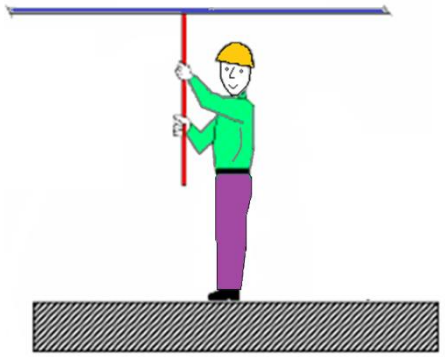
Presentation on the Topic

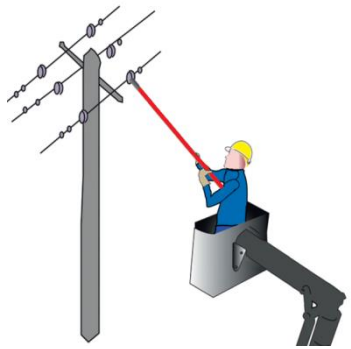
- **Through Hydraulic Lifts it may be done safely, which otherwise through ladders etc. is difficult. In this regard, following is important;**
  - Electrical Safety, Shock; Conformance to Standards (IEC/ ANSI..)
  - Mechanical Safety, Fall due to Unbalance, Design Standards for achieving mechanical balance & stability.
  - Clearances requirements & type of HL technique with respect to voltage levels & HL mtc. tools

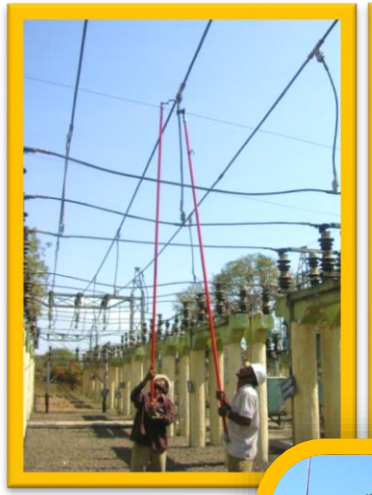
Presentation on the Topic

- Technologies Available;

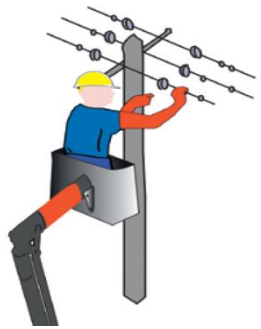
1. Hot Stick or Live line technique:







2. Insulating Gloves technique:



Presentation on the Topic

Safety Clearances; Osha Standards For Safe Working:

Voltage range phase to phase (in kV)	Clearance (in Meters)	Clearance (in Feets)
46.1 - 72.5	0.91	3
72.6 – 121	1.02	3.4
138 – 145	1.07	3.6
161 – 169	1.12	3.8
230 – 242	1.52	5
345 – 362	2.13	7
500 – 552	3.35	11

Presentation on the Topic

- Technologies Available.....

3. Bare-hand technique; Worker comes in direct contact of the live part, Worker is raised at the same potential to that of the live equipment.

   Isolation must from surroundings like tree branches, ground connections as no current should flows through the platform/ worker

Presentation on the Topic

- Technologies Available.....

  Insulated modular scaffolding system, maintenance activities in switchyards up to 765 kV;

  Hotspot rectification, jumper replacement, maintenance of isolator switches, clamps and connectors, Bus-bars

Important Points relating to DISCOMs

- Adaptability to the technology, Training, Behavioural issues & Technical Issues
- Cost- benefits; Cost of Shut Down, Redundancy in the system
- Incentives
- Operation & Maintenance aspects; Technology transfer
- Where it will be of more use; O/h, U/g network, Inside substations
- Accessibility of Road/ spaces for such HL Mtc.

Key Takeaways/ Recommendations

- In Power Distribution so far negligible use, but the new technology is welcome move; will enhance safety & reliability.
- Customised Solutions; for urban areas to work on MV, HT & LT systems.
- Awareness about relevant safety codes & standards wrt these solutions.
- Capacity building, training of manpower
- Initially these may be on hire/ contract basis
- Costs..
- Initial Stage; Selected Assets, Lines based on cost- benefit studies

Thank You

For discussions/suggestions/queries email: www.indiasmartgrid.org
www.isgw.in
Links/References (If any)

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