Electricity Safety and Governance

Prayas (Energy Group) Webinar
July 12, 2022
Outline

• Safety: A neglected area
• Accidents: High and increasing numbers
• Analysis: “Who dies, Where and Why”
• Towards a national program on electricity safety
• Question-Answer session
Scope and ...

Accidents – Electrocution or Fire

Natural causes - Lightning

Human death/injury

Animal death/injury

Property/Appliance damage

Electrical systems

Human death/injury

Animal death/injury

Property/Appliance damage

Approach

- Public safety: Not work-place or industrial safety

- Governance gap: Not technical fixes or accident compensation

- Human face, not a number game: Forward looking, action ideas for all
Safety: A neglected area

• No place in national policies, programs, rating framework ...
• Low priority area for distribution companies
• Many data gaps
• Many governance gaps, especially where most accidents occur

• Relatively a new area for Prayas
Safety: A neglected area

• Limited data sources
  – Accidental Deaths and Suicides in India (ADSI) reports of National Crime Records Bureau
  – General Review and Accident Statistics of Central Electricity Authority/Chief Electrical Inspector (CEA/CEI)
  – Reports of few State Chief Electrical Inspector to the Government - CEIG (Tamil Nadu, Karnataka, Gujarat, Kerala), KSEB Officers’ Association
  – DISCOM submissions to SERCs in few states (Andhra, Telangana, Maharashtra)

• Data challenges
  – Data gaps
  – Differences across sources
Accidents: High and increasing numbers (ADSI data)

- Increasing deaths, 5.9% CAGR
- Increasing fatality rate, 0.35 to 1.13 (1991-2020)
- Likely to further increase with network spread, better reporting
- Developed countries: Deaths reducing, and rates around 0.03
Accidents: High and increasing numbers (CEA data)

- Increasing fatal human accidents, 8.2% CAGR
- Increasing total accidents, 8.3% CAGR
- Increasing fatal accident rate, 0.28 to 0.58
- Each point in the graph is a tragic story
- Data issues ADSI Vs CEA Vs DISCOM
- Appliance, property damage not captured
Analysis: Who dies?

Based on regulatory submissions/CEIG reports

Highest accidents in distribution

Public highest, next is contract, then DISCOM staff

<table>
<thead>
<tr>
<th>DISCOM name &amp; year</th>
<th>DISCOM/Contract staff</th>
<th>Public</th>
<th>Total</th>
<th>Public %</th>
</tr>
</thead>
<tbody>
<tr>
<td>APEPDCL 2017</td>
<td>2</td>
<td>197</td>
<td>199</td>
<td>99</td>
</tr>
<tr>
<td>Karnataka 2019</td>
<td>18</td>
<td>405</td>
<td>423</td>
<td>96</td>
</tr>
<tr>
<td>KSEB 2019</td>
<td>12</td>
<td>237</td>
<td>249</td>
<td>95</td>
</tr>
<tr>
<td>MSEDCL 2017</td>
<td>32</td>
<td>799</td>
<td>831</td>
<td>96</td>
</tr>
<tr>
<td>TSSPDCL 2017</td>
<td>29</td>
<td>320</td>
<td>349</td>
<td>92</td>
</tr>
</tbody>
</table>
Analysis: Where do human accidents occur?

• Average human accidents/year: 10,841 (FY15-FY20, CEA)
• Geographical spread
  – 6 states (Karnataka, Maharashtra, MP, Rajasthan, TN, Telangana) account for 63% in FY15-FY20 (CEA)
  – Megacities around 10%, hence most accidents in Rural (ADSI till 2013)
  – In states, more in a few circles (districts): pumpsets, arid areas, poverty? (SERC submissions)
• Electrical spread
  – Distribution system and non-industrial consumer locations (CEA, CEIG reports)
  – 11 kV and below (TN, Karnataka Gujarat CEIG reports, KSEB OA report, TS DISCOM submissions)
Analysis: Why do human accidents occur?

- Electrocution accounts for 88% of deaths, fires 12%; 20% of total fire accidents are caused by electrical faults (ADSI)
- Most accidents occur in distribution system and at non-industrial consumer locations (70-90%)

- Immediate causes
  - Contact with live conductor, 11 kV and below
  - Sagging, snapping, exposed conductors, open junction boxes, shocks from appliance body
  - Fire due to electrical faults

- Root causes
  - Poor design, construction, maintenance, multiple joints, inadequate fencing of DTs, un-authorised work
  - Poor earthing and failure to isolate earth faults
  - Low safety awareness/priority – public, contractors and DISCOM staff
  - Governance gaps – not able to pin-point accountability for safety
Towards a national program on sustainable electricity safety

• Premise
  – Electricity accidents is an ongoing human tragedy: Requires mission mode program without waiting for changes in laws or regulations
  – Distribution sector requires support and collaborations to meet the safety challenge
  – Technical and management measures for safety are similar to those for quality & reliability of supply
  – Success in Connections, Hours of supply, Service quality: Now is the time to include Safety as a Quality attribute
  – Accident reduction is possible, with marginal investment and management attention – as already demonstrated by some

• Vision/Mission
  – Zero accidents through collaborative action
  – DISCOM & public focus, with milestones like: Reverse the trend in 2 years, 50% reduction in 5 years, 90% in 10 years

• Broad structure
  – Driven by MoP, like Distribution Reform (RDSS) or Rural Electrification (DDUGJY), with financial and knowledge support to needy States
  – Involvement of SERCs and safety professionals in planning and monitoring, in addition to MoP
  – Customisation of State programs in collaboration with non-electricity organisations (fire, police, roads, local administration)
  – Prioritisation of high accident districts/circles; Reward model rural/urban DISCOM circles for accident reduction
  – Development of institutions and systems to maintain the high levels of safety, after the mission
Towards a national program on sustainable electricity safety

<table>
<thead>
<tr>
<th>Actor</th>
<th>Current role</th>
<th>Action ideas</th>
</tr>
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</table>
| MoP      | Focus on DISCOM finances, markets, renewable                                   | - National program on electricity safety  
- Set up apex safety oversight body with penal powers /empower CEA  
- Strengthen and empower Chartered Electrical Safety Engineers |
| CEA      | Regulation, occasional accident analysis, reporting, training. Limited efforts in implementing regulations | - Improve data collection formats and reporting (accident-fatality, fire accidents, geographical and electrical spread)  
- Suggest uniform notified voltage for self certification (say 11 kV)  
- Commission third party safety audits  
- Mandate utilities to file periodic compliance and audit reports and check for compliance  
- Make the Standing Committee on Electrical Safety (SCES) broad-based with participation of professionals  
- Provide data and technical support to national safety program |
| State    | CEIG and DISCOM – appointment and budget support                               | - Prepare and monitor customised safety program  
- Set up and empower state level safety oversight body and SCES |
## Towards a national program on sustainable electricity safety

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| SERC  | Regulatory oversight on tariff and Quality of Supply & Service of DISCOM | - Simplify and enhance ex-gratia on humanitarian grounds (Forum of Regulators)  
- Standardise accident data reporting formats by utilities (FoR)  
- Proactive actions to push DISCOMs to implement safety regulations  
- Commission independent safety audits  
- Regulatory oversight of the safety program and DISCOM safety metric (include safety as a service attribute) |
| CEIG  | Inspection of HT systems, ED collection, Accident reporting | - Analysis (who, where, why) of previous accidents (as done by some CEIGs)  
- Improve data collection and reporting  
- Safety awareness in DISCOM staff, consumers, public  
- Participate in the safety program |
| DISCOM | High focus on revenue, limited on QoS | - Strengthen safety institutional structure with Director level post and dedicated safety officers upto district/taluk level  
- Prepare safety metric with Director level monitoring  
- Conduct periodic safety inspections, especially 11 kV and below  
- Fix accountability of staff, consultants and contractors  
- Use of technological options like ABC, Pole guards, RCCB, better earthing ...  
- Mobile/internet/toll free number for safety reporting by public  
- Safety awareness in field staff, consumers, public  
- Implement the safety program |
Towards a national program on sustainable electricity safety

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<tbody>
<tr>
<td>Professionals</td>
<td>Industrial safety</td>
<td>- Give equal or more attention to distribution and non-industrial safety</td>
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<td>- Develop technology/management innovations (cost effective fault isolation in 11 kV and LT systems, safe starter for pumpsets, Failure Modes and Effects Analysis (FMEA) for accident prevention ...)</td>
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<td>- Pilot safety audits with support from volunteers</td>
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<td>Consumer groups</td>
<td>Supply complaints, accident ex-gratia</td>
<td>- Independent safety audits</td>
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<td>- Safety awareness programs for public and students</td>
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<td>- Use available tools to report safety concerns</td>
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“It is not that I am so smart, it is just that I stay with the problems longer”

Need to stay longer with the electricity accident problem to understand and address it to ensure: 
**Universal, quality, affordable, safe electricity**

**Electricity safety: Tragically falling through the governance gaps**

https://energy.prayaspune.org/
energy@prayaspune.org

QUESTIONS ???