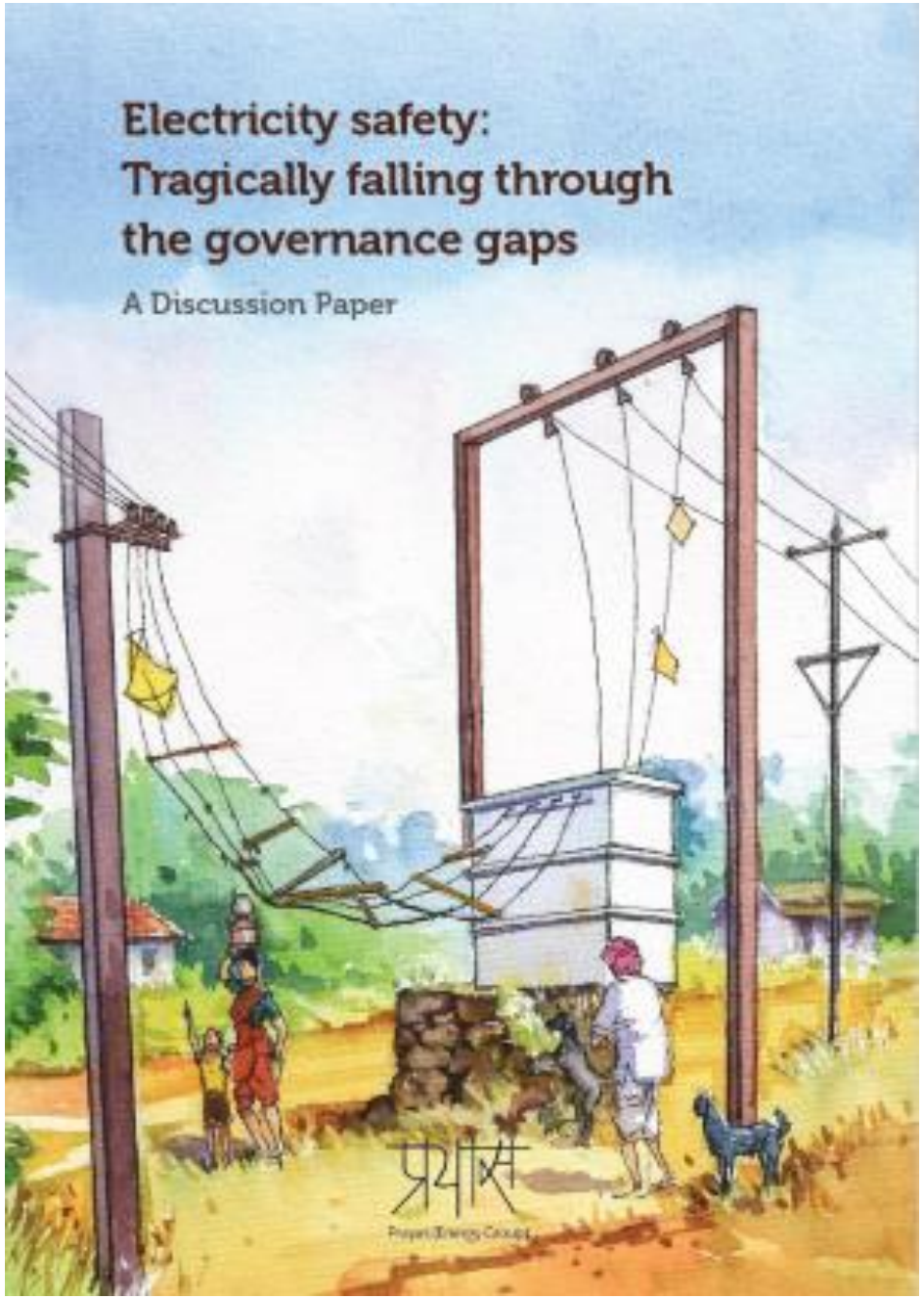
Electricity Safety and Governance



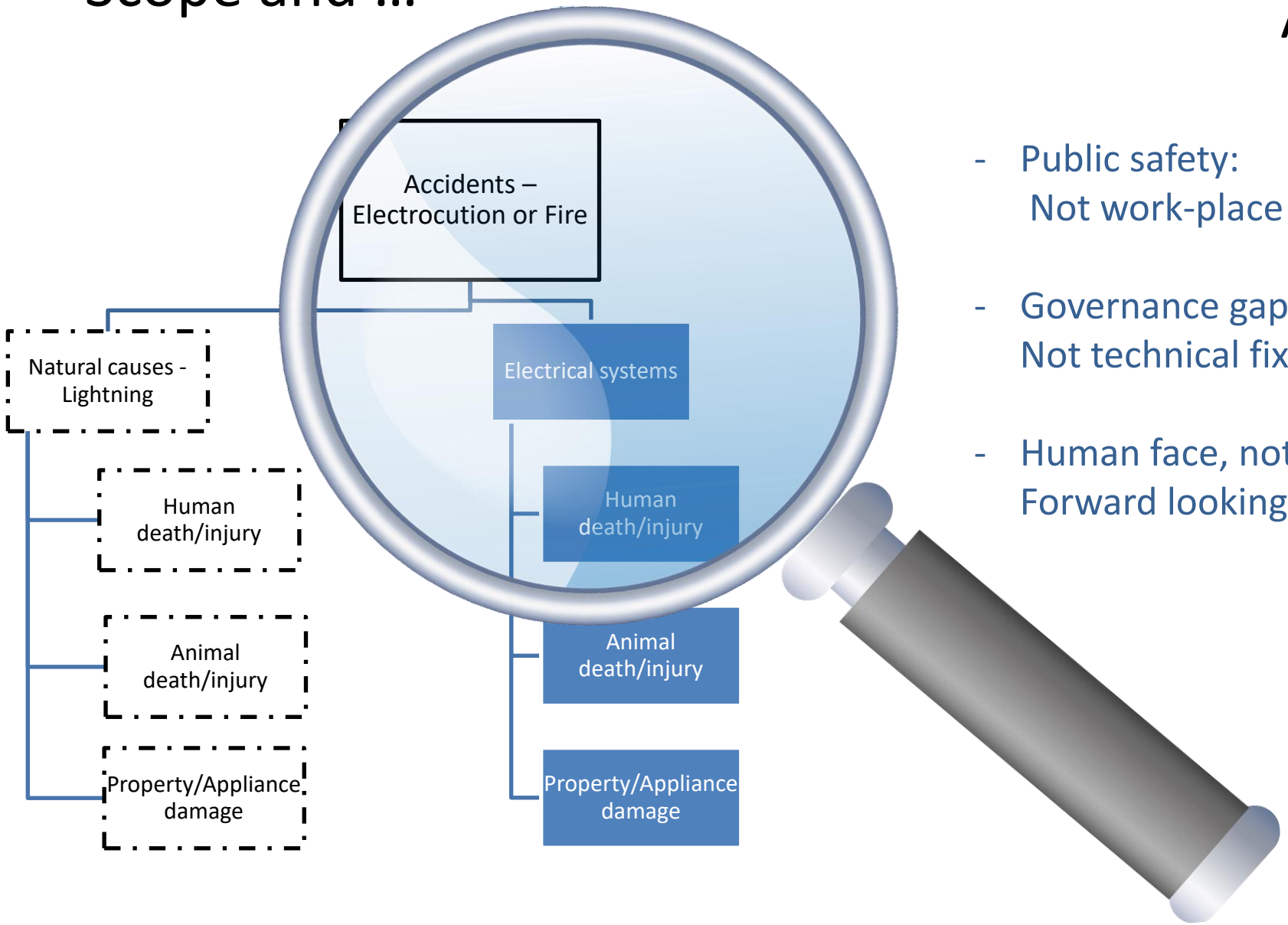
Prayas (Energy Group) Webinar

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 …



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

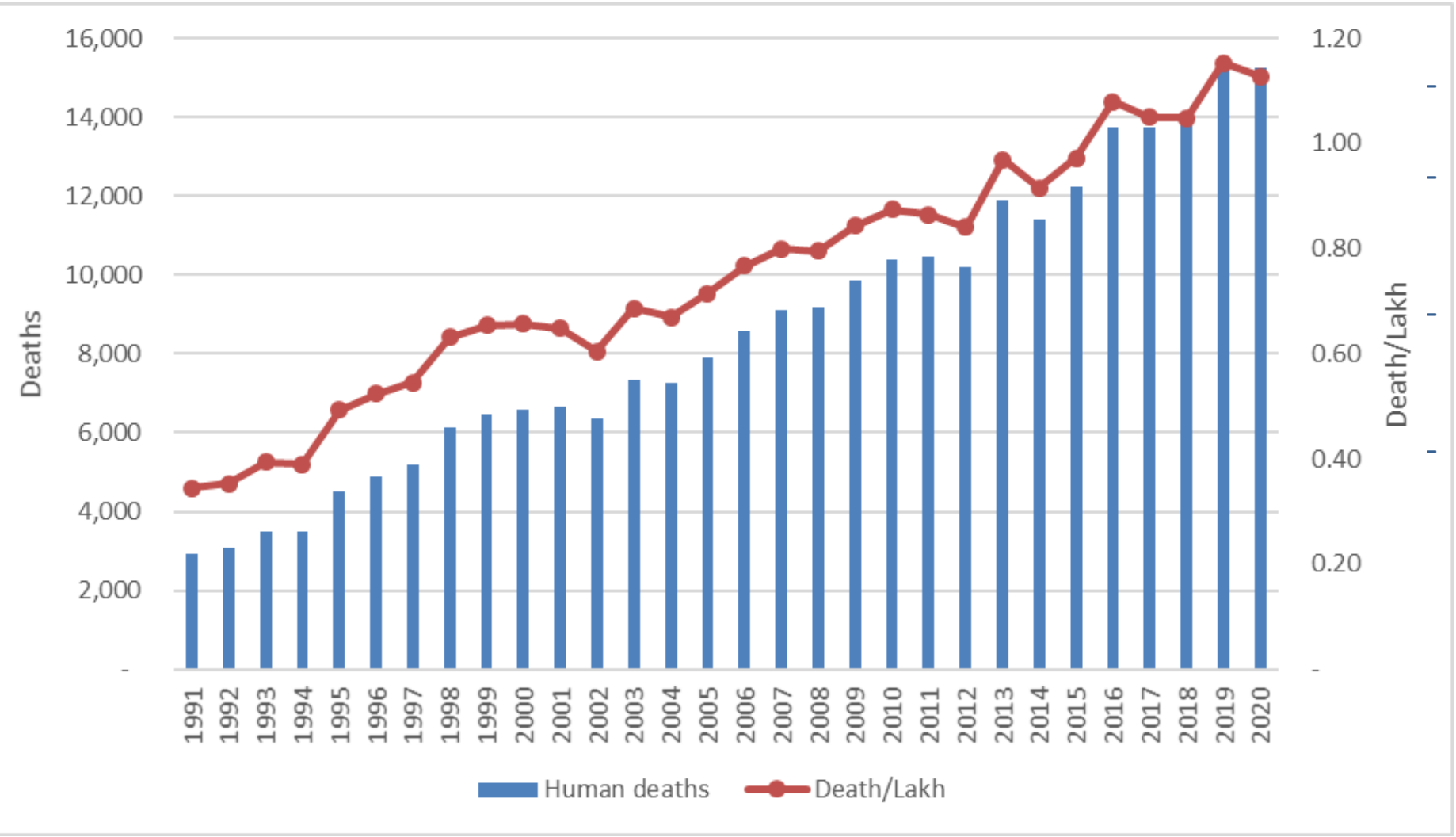
- Relatively a new area for Prayas

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)
  - Few regulatory orders (Rajasthan, AP, TS, UP: 2019-2022), CAG report (TS – CEIG: 2018), CEA/CEI workshops (2021-22), OERC accident analysis (2009)

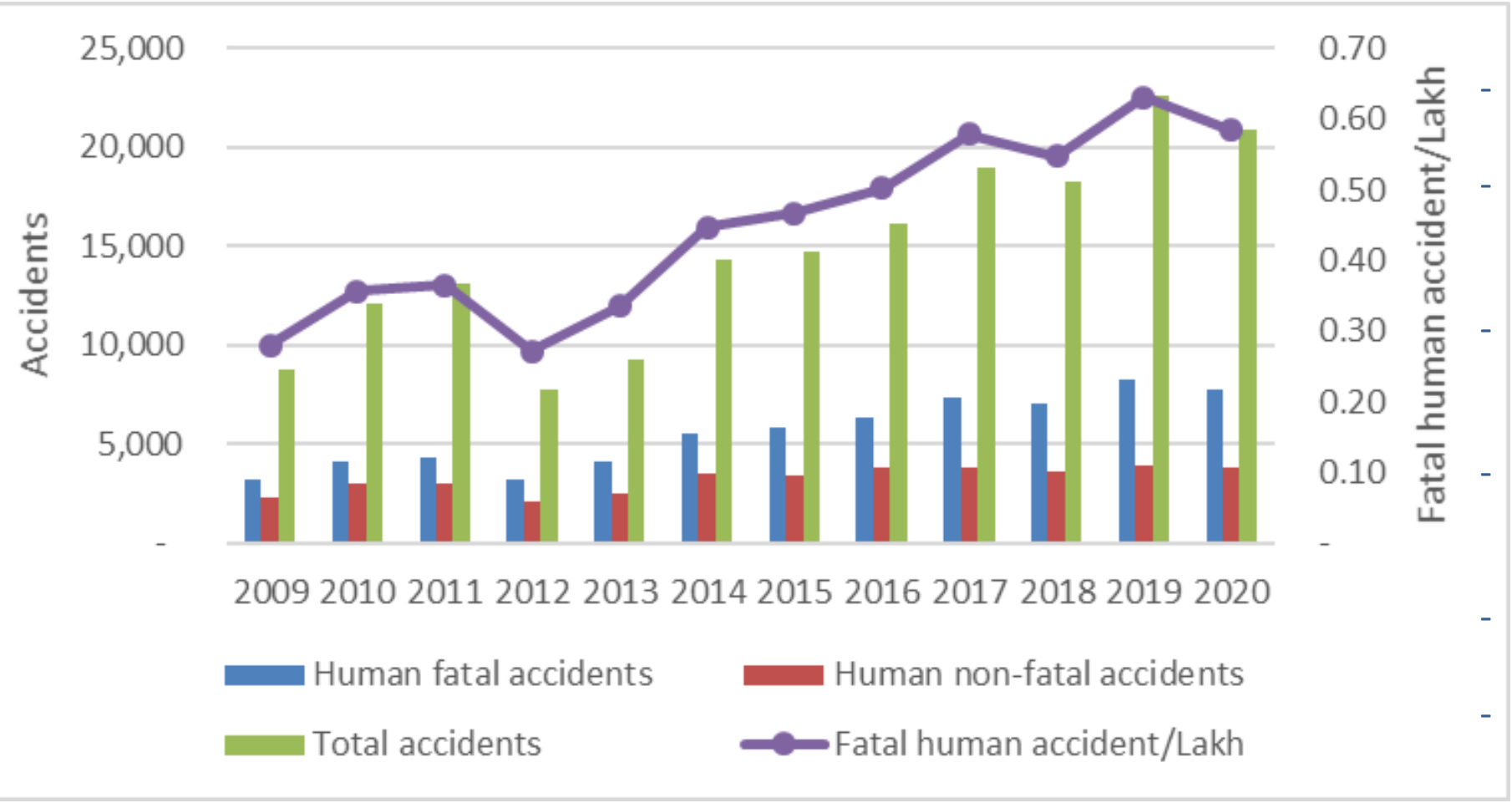
- Data challenges
  - Data gaps
  - Differences across sources

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?

DISCOM name & year	DISCOM/ Contract staff	Public	Total	Public %
APEPDCL 2017	2	197	199	99
Karnataka 2019	18	405	423	96
KSEB 2019	12	237	249	95
MSEDCL 2017	32	799	831	96
TSSPDCL 2017	29	320	349	92

Based on regulatory submissions/CEIG reports

Highest accidents in distribution

Public highest, next is contract, then DISCOM staff

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

Actor	Current role	Action ideas
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-fatalities, 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

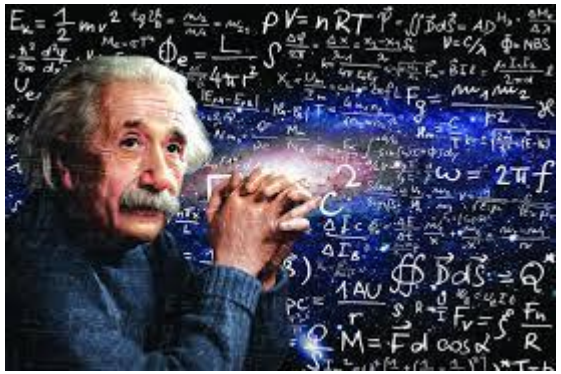
Towards a national program on sustainable electricity safety

Actor	Current role	Action ideas
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

Actor	Current role	Action ideas
Professionals	Industrial safety	- Give equal or more attention to distribution and non-industrial safety - 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 …) - Pilot safety audits with support from volunteers
Consumer groups	Supply complaints, accident ex-gratia	- Independent safety audits - Safety awareness programs for public and students - Use available tools to report safety concerns

“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]

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QUESTIONS ???