

**Prayas (Energy Group) comments on draft Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2022**

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Note: Prayas commentary is in normal font, Quote from draft Regulations are in *Italics*, suggestions are in **Bold**.

### 1 Regulation 2: Definitions

#### Additions

We suggest that some more terms could be added to the list.

- a. **Electricity Accident: Unexpected event caused due to the electrical system, through electrocution or fire due to electrical faults, leading to death or injury to humans or animals; damage to appliance or property. Events due to direct lightning strikes are not included.**
- b. **Fatal electricity accident: An electrical accident in which one or more humans or animals die**
- c. **Electricity accident fatalities: Number of human or animal deaths in an accident**
- d. **Point of commencement of supply: As defined in the relevant code of the licensee. (Regulations 2 (69) and 15 briefly mention point of commencement of supply)**

#### Modifications

Notified voltage is defined now as follows:

*(62) “notified voltage” means a voltage notified by the Appropriate Government under intimation to the Authority for the purpose of specifying the voltage level upto which self-certification is to be carried out under regulation 32 and regulation 45;*

We suggest that a guideline for notified voltage as 11 kV can be part of the definition.

#### Suggestion:

*(62) “notified voltage” means a voltage notified by the Appropriate Government under intimation to the Authority for the purpose of specifying the voltage level upto which self-certification is to be carried out under regulation 32 and regulation 45, **with the typical value being 11 kV;***

### 2 Regulation 5 (1): Electricity Safety Officer (ESO)

There are guidelines (Schedule XII of the Regulations) for determining adequacy of designated supervisors on duty in every mine or oil-field while electricity is being used. However, no such guidelines for other sectors (including Distribution) given. We note that Regulation 5(3) mentions that there should be a safety officer for every electrical installation with electrical load more than 2000 kW. We suggest that the guidelines for the safety institutional structure for electric utilities also form part of this Regulation. Based on the situation in the state/region, norms for the number of safety staff could be based on the number of consumers, kWh sold, circuit kilo-meters, or kW connected load.

Suggestion:

**Distribution Licensees should prepare a safety institutional structure with dedicated officials at the head office, circle, division and sub-division levels. Suitable norms for the number and deployment of safety staff could be developed in consultation with the Authority and the Appropriate Government.**

### **3 Regulation 5 (3): Periodic Inspection by ESO**

We feel that this Regulation has to be modified to ensure periodic inspection of Distribution Transformers and LT lines. Depending on the local situation, periodicity of inspection of DTs and LT lines can be changed to once in three years, with a provision of regular surprise inspections.

Suggested modification

*(3) For every electrical installation including factory registered under the Factories Act, 1948 (63 of 1948) and mines and oil field as defined in the Mines Act, 1952 (35 of 1952), where more than 2000 kW of electrical load is connected, the owner of the installation or the management of the factory or mines, as the case may be, shall designate Electrical Safety Officer under sub regulation (1) and having qualification and experience specified in sub-regulation (2), for ensuring the observance of the safety provisions laid under the Act and the regulations made thereunder, who shall carryout recommended periodic tests as per the relevant standards, and inspect such installation **(including Distribution Transformers and LT lines)** at intervals not exceeding one year, **or once in three years, with the provision of regular surprise inspections**, and keep a record thereof in Form I or Form II or Form III or Form-IV, as the case may be, of Schedule IV to these regulations; test reports and a register of recommendations in regard with safety duly acknowledged by owner; compliances made thereafter; and such records shall be made available to the Electrical Inspector, as and when required.*

Addition of third-party inspection

**Appropriate Regulatory Commission to ensure periodic third- party safety audit of the distribution infrastructure, by CESE or certified safety organisations, on a sample basis at least once in 3 years, as per procedure laid down by the Commission.**

### **4 Regulation 6: Chartered Electrical Safety Engineer (CESE)**

As per the Regulations, the burden of finalising the process of recruiting CESEs and supporting them is with the Appropriate government. Schedule XIV of the draft Regulations covers Qualification & Experience for Authorising CESE. There has been erratic/slow progress on this after its introduction in 2015 and issue of guidelines in 2018.

Suggestion:

**The selection process and re-certification of CESE could be conducted at a national level by CEA or any designated agency like the Institution of Engineers. This would streamline and speed up the process and will also ensure that services of CESEs are used in multiple states. Periodic re-qualification through review of performance reports or written tests could be planned once in 5 years (after the 3-year initial authorisation and 2-year extension, as mentioned in 6c of Schedule XIV).**

## 5 Regulation 8: Qualifications and training

The 2010 regulation had detailed training syllabus, but the 2022 Draft has it only for mines (Schedule XIII). Training should also cover contract staff, licensed electricians and general public.

Suggestion:

**We suggest that the Regulation include training syllabus for generation, transmission and distribution staff.**

**Since sub-contracting is significant in construction and O&M in the distribution sector, training should be conducted for contract staff as well.**

**State Electrical Inspectorates/Regulatory Commissions/distribution companies should take pro-active efforts to train electricians and general public, in association with consumer groups and professional bodies.**

## 6 Regulations 10–13: Keeping of Records, and kept open for inspection

These Regulations mention that updated maps are to be available with licensees, as well as Electrical Inspectorate. As per 13 (3), these maps are to be available to applicants. This is indeed a good practice, but needs to be checked if it is being followed. (Suggestion regarding this given in 19a)

## 7 Regulation 16: Switchgear on consumer's premises

Regulation 16 (1) specifies that supplier will provide suitable switchgear for every service line, which shall be contained within an adequately enclosed fireproof receptacle. It is to be examined if fireproof receptacle is practical for all service lines, or there can be exceptions. Pole mounted service connection box with a common isolator in the incoming side can also be an option.

Suggestion:

**Fireproof receptacle and pole mounted service connection box could be suggested for specific situations.**

## 8 Regulation 18: Earthed terminal on consumer's premises

The Regulations state:

*(1)The supplier shall provide and maintain on the consumer's premises for the consumer's use, a suitable earthed terminal in an accessible position at or near the point of commencement of supply as per IS 3043*

*Provided that in the case of installation of voltage exceeding 250 V the consumer shall, in addition to the aforementioned earthing arrangement, provide his own earthing system with an independent electrode and same shall be interlinked with the earthed terminal mentioned in sub regulation (1) through a suitable link.*

We suggest that CEA should review if this regulation is needed and if it is practical to be implemented by Distribution licensees. Provision of earthing could be done on a selective basis by DISCOMs, but is it needed to make it mandatory? 18 (3) also mentions that supplier may recover charges from the consumer, which also makes the arrangement less attractive.

Suggestion:

**Consumer to provide earthing, which shall be inspected by CEIG or distribution company while granting connection, as well as on a periodic basis.**

## **9 Regulation 19: Accessibility of bare conductors**

The current Regulation refers to bare conductors in building and the need to make them inaccessible to public etc. Similar situation exists when bare conductors of overhead lines are close to buildings either due to issues with building construction or with the lay-out of lines. In either of the cases, it is better that the distribution company provide insulation sheathing near the building or explore re-routing the line, without waiting for the legal issues to be sorted out.

Suggested addition:

**When the bare conductors are in close proximity to buildings, the distribution company should take up safety measures like providing ABC conductors, cables, insulation sheathing or where possible, re-routing the lines. Cost sharing with consumers can be considered when possible.**

## **10 Regulation 25: Street Boxes**

The Regulations state:

*(4) The owners of all street boxes or pillar boxes containing circuits or apparatus shall ensure that their covers and doors are kept closed and locked and are so provided that they can be opened only by means of a key or a special appliance.*

*(5) The street/Pillar boxes shall be erected with the live parts at least 2 feet above the ground level or above the flood level of the local site condition, whichever is higher.*

This is also a good regulation, but not well implemented. Suggestions on this are given in 19a.

## **11 Regulation 32: Periodic inspection and Regulation 45: Approval by Electrical Inspector and self-certification**

As mentioned in the Section 1 (Definitions), it is better to give guidelines for notified voltage value, in this Regulation, rather than leaving it to the States. We have suggested 11 kV, above which shall be inspected by CEIG. Inspection procedure for 11 kV and below (self-certification) should also form part of Regulation. Currently distribution companies carry out pre-monsoon inspections, typically once a year, with reliability of supply as the main focus. Safety should also be an equally important consideration for such inspections. Guidelines for inspection could form part of the Regulation, as an Annexure, for example, as detailed by Maharashtra State Electricity Distribution Company Ltd.:

<https://www.mahadiscom.in/consumer/wp-content/uploads/2019/08/Inspection-of-Installations-upto-Notified-Voltage-Circular.pdf>

Suggestion:

**Periodic inspection of distribution systems above notified voltage shall be carried out by Electrical Inspector and at or below notified voltage by ESOs. In addition, third party safety inspections should be carried out for a sample of the system. The guidelines for periodic inspection should be part of the Regulation.**

## 12 Regulation 44: Residual Current Device

The Regulation correctly recommends use of RCDs with proper settings for all installations. But the uptake is very low and hence CEA could make special efforts to increase the uptake, to begin with for new connections and slowly extend to existing connections. CEA could make strong recommendations to include RCDs as part of the Revamped Distribution Sector Scheme (RDSS) and Smart Meter roll-out programs. In addition to consumer locations, the use of RCDs at Distribution Transformer locations could be explored.

## 13 Regulation 58: Joints

The draft Regulations state:

*(1) There shall be no Joints on the Wires or Cables or lines taken for temporary purpose.*

Badly done joints are major causes for high losses, sparks and snapping. Regulation 56(1) of the 2010 Regulations stipulated not more than one joint in a span. We feel that this was a good provision. But the current draft Regulation is silent on the allowable number of joints on a permanent line.

Suggestion:

**Please retain the existing regulation stipulating "not more than one joint in a span" (as in Regulation 56(1) from "CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010"). Further, no joint shall be allowed between two poles where the line crosses road, rail, canal or any crowded places like educational institution, hospital, place of worship, play-ground etc.**

## 14 Regulation 60: Clearance in air of the lowest conductor of overhead lines

It is good to see Regulation 60 (2).

*(2) In case of electric lines of 33 kV and below passing through habituated urban or rural areas, any forest areas other than National Parks, Wildlife Sanctuaries, Conservation Reserves, Community Reserves, Eco-sensitive zones around the protected areas and Wildlife Corridors, underground cable or Aerial Bunched Cable or Covered Conductor shall be used.*

Suggestion:

**Since most of the overhead lines of 33 kV and below pass through inhabited rural or urban areas, there should be plan to replace the existing lines with ABC/underground cables on a priority basis in cases of aged conductors, extremely crowded areas, accident or theft prone areas etc. CEA could strongly recommend this to be part of RDSS initiative. The new lines through such areas should be ABC or underground cables only.**

## 15 Regulation 69: Maximum interval between supports

Draft Regulation suggests that span can be decided based on Regulation 59 (Maximum stresses and factors of safety). Considering the higher number of accidents related to low voltage overhead lines due to snapping, sagging and leaning poles (especially in the rural areas), it is better to stipulate the maximum allowed spans (without any relaxations by any authority) for distribution lines at 11 kV and below, in the regulation.

Suggestion:

**Provide the permissible spans for distribution lines at 11 kV and below, especially when the line is passing through inhabited locations.**

## **16 Regulation 73: Service lines from overhead lines**

Regulation 71 of existing Safety Regulations 2010 mentions "Provided that the number of tappings per conductor shall not be more than four in case of connections at voltage not exceeding 650 V". This clause is deleted in the current draft.

Suggestion:

**Please mention the maximum number of tappings allowed at the point of support in the regulation. It is better to have a limit of four or whatever is reasonable.**

## **17 Regulation 76: Safety and protective devices**

Regulation 76 (1) states:

*(1) Every overhead line which is not being suspended from a dead bearer wire, not being covered with insulating material and not being a trolley-wire, is erected over any part of a street or other public place or in any factory or mine or on any consumer's premises shall be protected with earth guarding (**typo**) for rendering the line electrically harmless in case it breaks.*

If public spaces include road sides, open spaces or fields in rural areas etc, then this provision is very costly and tough to implement and maintain. Relay based protection at the 33-kV substation to isolate high impedance ground faults is also costly, but it is worth setting up pilot projects to explore feasibility.<sup>1</sup>

A pragmatic approach is to limit the use of guard wires to road/railway crossings. In other areas, use of earthed pole guards, as tried in Tamil Nadu and Karnataka and described in a technical IEEE paper should be explored.<sup>2</sup> This can be limited to 11 or 33 kV overhead lines and are also needed when 11 kV and LT lines are strung on the same poles.

Suggestion: Please modify as suggested in bold text.

*(1) Every overhead line which is not being suspended from a dead bearer wire, not being covered with insulating material and not being a trolley-wire, is erected over any part of a street or other public place or in any factory or mine or on any consumer's premises shall be protected with earth **guarding in cases when the line is crossing major roads or rail and use of earthed pole guards in other cases** for rendering the line electrically harmless in case it breaks.*

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<sup>1</sup> For example see: [https://www.researchgate.net/publication/347248949\\_A\\_Review\\_on\\_High-Impedance\\_Ground\\_Fault\\_Detection\\_Techniques\\_in\\_Distribution\\_Networks](https://www.researchgate.net/publication/347248949_A_Review_on_High-Impedance_Ground_Fault_Detection_Techniques_in_Distribution_Networks)

<sup>2</sup> See: <https://ieeexplore.ieee.org/document/8558096>

## 18 Chapter XIII – Solar, Regulation 136: Protection, testing and interlocking requirements

This chapter is a good addition to the Regulations. Shock accidents to staff due to back feed has been reported and there is a need to prevent this.

Suggested addition:

**Include prevention of back-feed for solar inverters as well as line inverters installed at homes/commercial establishments by ensuring 2-pole (single phase) or 4-pole (3-phase, 4-wire) change-over switching arrangement.**

## 19 Suggestions towards better implementation of Regulations

Preparing a good set of Regulations is a necessary condition to ensure safety in the electricity sector, but certainly not sufficient. We feel that most of the safety challenges are in the distribution sector, which is under the management of States or few private companies. In order to ensure better compliance of these Regulations, a few additional Regulations could be added for periodic monitoring of compliance, better reporting, encouraging safety culture etc. We have mentioned this in our recent discussion paper, “**Electricity safety: Tragically falling through the governance gaps**”, available at: <https://energy.prayaspune.org/our-work/research-report/electricity-safety>. Some relevant suggestions are given below.

- a) **Regulatory compliance report:** At the licensing stage and subsequently on an annual basis, distribution companies should prepare Regulation wise compliance reports. This could cover 33 kV distribution substation (incomer, transformer, bus bars, outgoing feeders, relays, protection, earthing, record keeping), 11 kV feeders (poles, conductors, insulators, earthing, proximity to buildings, ground clearance), Distribution Transformers (platform, fencing, switch boards, earthing, protection), LT lines (poles, conductors, insulators, use of poles for internet cables/street light wiring, switch boards, proximity to buildings, ground clearance), sample consumer locations (healthy neutral conductor, meter, switch gear, internal wiring, earthing, RCD). There should be separate formats for cases like use of Single Wire Earth Return (SWER) or HVDS systems. Formats for these could be prepared by CEA. These compliance reports should be made available at the websites of the licensees and summary reports on the website of CEA.  
**A Regulation along these lines should be added.**
- b) **Periodic audit of protection system:** Proper functioning of the protection system, especially on the 11-kV feeder and DT locations are very crucial to isolate ground faults and prevent accidents. **Hence there should be a new Regulation suggesting periodic auditing of the protection system on a regular basis and whenever there are major changes in the network.**
- c) **Improving Accident reporting:** Currently distribution companies/ State Electrical Inspectors report accidents using Form A, Form 19 and Form 20. There is a need to improve these Forms, for example to separately report the number of fatalities (in addition to the number of fatal accidents), include accidents due to fire caused by electrical faults, provide more details of electrical location of accidents (generation, transmission, distribution system at different voltage levels, DT locations, consumer locations by category etc), and geographical locations (circle, division, sub-division). These forms could be part of this Regulations and feedback sought to improve them. Quarterly accident reporting should be available at the websites of distribution companies and State Electrical Inspectors. CEI of CEA should provide updated summary reports



of accidents (as of now only accident data for FY14, FY15 and FY16 are available on the CEI website link). CEA General Review provide statistics of electricity accidents, but there is scope of improving these reports, by including more inputs collected from states **These should be covered in a new Regulation in the draft.**

- d) **Accident analysis reports:** CEI prepares analysis reports of a few accidents and CEIGs of some states (Tamil Nadu, Karnataka, Gujarat etc) have prepared accident analysis reports for few years. State CEIGs should be mandated to prepare accident analysis reports on a periodic basis – say once in 3 years and make it available on its website. CEI could prepare summary of these analysis reports and make it available on its website. **These should be covered in a new Regulation in the draft.**
- e) **Replacing aged equipment and conductors:** Many accidents happen due to aged conductors, transformers, relays or circuit breakers. Aged infrastructure should be identified in the periodic safety audit (mentioned in a) and b) above). Regulation should suggest typical timeframes to replace such aged infrastructure. **These should be covered in a new Regulation in the draft.**
- f) **Separation of Regulations for Electricity from those for Railways, Mines, Oil fields:** The current draft (and previous versions) cover electricity and few other sectors. There are indeed many common technical aspects across these sectors. But there are major differences in the institutional structures, capacity and governance processes. Hence it is better to separate out the electricity sector Regulations. These Regulations would cover implementation and oversight procedures, in addition to technical parameters. There can be separate Regulations for other sectors. **CEA could kindly consider such a separation of Regulations.**
- g) **Ensuring consistency:** The 2010 regulation covered 250 V, 650 V and above 650 systems, whereas the 2022 draft covers 250 V, 1000V and above 1000 V. While this is perhaps a welcome step, the 2022 draft still has few mentions of 650 V. For example, see Regulations 37 (3), 45 (8) and 115. **Please correct this, if it is a typo.**

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