

## **Standard Operating Procedure (SOP) for developing up upstream depot infrastructure for e-bus operations:**

This Note has been prepared for the benefit of State Transport Undertakings as a guidance document to help them understand the costs and needs of creating adequate charging infrastructure for depots. This Note comes in support of the National Electric Bus Program (NEBP) currently managed by CESL by way of mandate given by NITI Aayog. The NEBP is targeted at 50,000 e-buses in India.

Transition of conventional public transport fleets to fully electric ones needs appropriately designed bus depots with adequate charging and upstream infrastructure to meet charging demand of these buses. As an extension to the Expression of Interest (EOI) issued on 12<sup>th</sup> July 2022 to State Transport Undertakings (STUs) and other transit agencies, through this note CESL intends to share the Standard Operating Procedure (SOP) for developing upstream depot infrastructure for e-bus operations.

Following are the SOP to be followed for developing upstream depot infrastructure for e-bus operations by STUs.

**Step 1: Load estimation for e-bus operations.**

**Step 2: DISCOM connection process for upstream depot infrastructure.**

**Step 3: Survey and land requirements for upstream depot infrastructure.**

**Step 4: Demand estimates by DISCOM for upstream depot infrastructure.**

**Step 5: Agreements to be entered between STU and DISCOM.**

**Step 6: Payment against demand note.**

**Step 7: Timelines.**

### **1. Load estimation for e-bus operations:**

An estimate of number of chargers required to operationalize a bus depot with 100 pure e-buses is presented in Table -1. Assuming that the electric public buses would be subjected to both day and night charging in STU owned bus depots, the charger requirement for AC and Non-AC buses of 12m and 9m length has been worked out as follows:

Table 1: Depot Power requirement for 9 and 12m e-buses

Sl. No.	Description	9m AC Bus	9m Non-AC Bus	12m AC Bus	12m Non-AC Bus
1	Rated Range (Km)	180	180	200	200
2	On Board Battery Capacity(kWh)	220	200	350	260
3	Energy Consumed (kWh/Km)	1	0.85	1.3	1.1
4	Daily Run (Km)	200	200	225	225
5	No of e-buses	100	100	100	100
6	Proposed Capacity of Charger (kW)	180	180	240	240

Sl. No.	Description	9m AC Bus	9m Non-AC Bus	12m AC Bus	12m Non-AC Bus
7	Bus/charger ratio	4	4	4	4
8	Estimated no. of Chargers to meet energy demand-Dual Gun	25	25	25	25
9	Total Charger load/ Bus Depot (kVA)	4500 <sup>1</sup>	4500	6000	6000
10	Upstream Capacity required/Depot (mVA)	4.5	4.5	6.0	6.0

Depending on the STU plans for deployment of 100 e-buses per depot, the load estimation varies from 4500 kVA to 6000 kVA per depot.

## 2. DISCOM connection process for upstream depot infrastructure:

- STU have to finalise their depot plans for parking of e-buses and establishing EV chargers for e-bus operations.
- STU have to prepare a layout (civil drawing) of their depot with area earmarked for e-buses and EV chargers for e-bus operations.
- After finalisation of load estimates for e-bus operations, STU have to submit the application (online or offline as per the DISCOM process) under the HT/EHT connection category to concerned DISCOM.
- Applicable application fee as per DISCOM rates and requisite documents have to submitted by STU while forwarding the application to DISCOM.
- Incomplete documentation or insufficient information could lead to auto cancellation of application submitted by STU. Therefore, STU have to ensure completeness in the application submitted to DISCOM.

### Classification of Supply under Regulation 6(1) of Supply Code Regulations (Delhi)

Sl. No	Classification	System of Supply
1	High Tension	
a.	Load exceeding 100kW/108kVA and up to 4000kVA	3 phase at 11kV
2	Extra High Tension	
a.	Load exceeding 4000kVA	3 phase at 33kV or above

## 3. Survey and land requirements for upstream depot infrastructure:

- DISCOM will conduct a technical and commercial feasibility surveys against the STU application for the load demanded.
- DISCOM will recommend the space requirements for Electrical Substation Space (ESS) within the premise of STU.

<sup>1</sup> Charger utilization/efficiency factor assumed at 80%

- The space requirement for ESS may vary depending on the supply voltage and demanded load by STU governed by the DISCOM supply code regulations.

Space for installation of Grid substation, transformers, service line meter and other equipment under regulations 22 of Supply Code Regulations (Delhi):

In case the load demanded by the STU is 1MVA or above at HT level, space for installation of grid sub-station is as under.

Sl. No	Sub station Type	Size (Meters)
(i)	Air – insulated Sub-station – 66/11 kV Grid sub-station with 2PTR	80M x 60M
(ii)	Air – insulated Sub-station – 66/11 kV Grid sub-station with 3PTR	90M x 80M
(iii)	Air – insulated Sub-station – 33/11 kV Grid sub-station with 2PTR	45M x 35M
(iv)	Gas – insulated Sub-station – 66/11 kV or 33/11kV	50M x 30M

STU have to provide additional space for DT substation for taking supply at Low Tension level or requiring LT Service connections from DISCOM have to provide additional space approx. 5\*(4M x 5.3) and STU shall approach DISCOM for approval of space and layout.

#### 4. Demand estimates by DISCOM for upstream depot infrastructure:

- DISCOM will generate a demand note for providing demanded load up to STU boundary at 11kV voltage levels governed by their supply code regulations.
- STU could opt for Deposit Work scheme of DISCOM for developing the distribution infrastructure from 11kV/415V up to the proposed Chargers location.
- Alternatively, STU may also execute upstream infrastructure on their own under the provisions of DISCOM supply code regulations for HT/EHT connections. In such cases, applicable supervision charges of DISOM have to be paid by STU.
- STU have to provide test reports and safety certificates for the EV chargers planned to be installed.
- STU have to provide the clearances for all the HT equipment's to be used at site by the DISCOM/Electrical Inspectors.

#### 5. Agreements to entered between STU and DISCOM:

- After Handing Over or Taking Over (HOTO) of space by DISCOM, standard agreement will be signed between DISCOM and STU.
- Agreement template of DISCOM shall be followed by STU.

#### 6. Payment against demand note:

- STU shall release the applicable payment to DISCOM towards the meter connection and demanded load based on the generated demand note along with the refundable security deposit.
- Payment for load application in case of HT is as below:

- a. 100% Road Restoration (RR) cost will be borne by STU
  - b. HT cable, accessories, labor and switch gear cost will be spitted between DISCOM and STU in 50:50 ratio
  - c. Cost and labour of metering unit be borne by DISCOM
  - d. Civil work, construction of electrical substation including the transformer cost will be 100% borne by STU
  - e. Maintenance of the electrical substation space (ESS) will be in the scope of STU.
  - f. 100% of payment for load application including civil work has to borne by STU in case of EHT connections.
- Typically above process takes close to 3-4 months for completing above steps from (1) to (6)
  - Tentative estimated cost of upstream depot infrastructure including civil works for 100 buses per depot is between 5-6 Cr. Ratio of buses per charger is assumed 1:5

**7. Timeline:**

- Based on the load demanded by STU, for providing new connections requiring augmentation of distribution system by DISCOM, the approximate time schedule is as under.

(i)	Electrified Areas (where existing 11kV network needs to be augmented)	Within 6 months from the date of receipt of payment against demand note
(ii)	Electrified Areas (Where existing 66/33kV grid sub-station needs to be augmented)	Within 8 months from the date of receipt of payment against demand note