



# **Resource Adequacy Plan for Transmission System of Kerala up to the year 2034-35**

**Government of India  
Ministry of Power  
Central Electricity Authority**



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## EXECUTIVE SUMMARY

The Resource Adequacy Plan (RAP) for the Intra-State Transmission System (ISTS) in Kerala aims to ensure the reliability and stability of the power grid in the State up to the year 2034-35. The primary objective is to assess and address the adequacy of transmission infrastructure, ensuring that it can meet the growing demand for electricity while incorporating renewable energy sources and optimizing existing resources. The document outlines the expected electricity demand, generation capacity and the requisite transmission infrastructure developments over the next decade. The plan evaluates Kerala's current transmission infrastructure, projected power demand, renewable energy integration and identifies system integration required to maintain grid stability and adequacy in the coming decade.

As on March 2026, Kerala's total installed capacity stands at 3,221 MW, comprising 2,284 MW hydro, 536 MW thermal and 400 MW renewable energy, supplemented by 1,912 MW of roof top solar. The state recorded a peak demand of 5,836 MW in the month of March, 2026.

At the end of year 2029-30, the peak demand is expected to rise to 7,916 MW, with new generation of 120 MW hydro, around 300 MW of wind generation capacity and 1,200 MW of solar generation including rooftop capacity to be added in Kerala along with 800 MW of Battery Energy Storage system (BESS). Key additions include 400 kV substations at Edamon and Kazaragod, further strengthening southern Kerala's grid and enhancing system resilience.

Summary of transmission systems planned under ISTS and InSTS to be commissioned by year 2029-30 is given below:

|                                                | 400 kV | 220 kV | Total |
|------------------------------------------------|--------|--------|-------|
| <b>Inter-State Transmission System (ISTS)</b>  |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 2500   | 0      | 2500  |
| <b>Transmission Line (ckm)</b>                 | 474    | 0      | 474   |
| <b>Intra-State Transmission System (InSTS)</b> |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 3000   | 5500   | 8500  |
| <b>Transmission line (ckm)</b>                 | 20     | 472    | 492   |

Summary of tentative transmission system planned under ISTS and InSTS to be commissioned between 2030-31 and 2034-35 is given below:

|                                                | <b>400 kV</b> | <b>220 kV</b> | <b>Total</b> |
|------------------------------------------------|---------------|---------------|--------------|
| <b>Inter-State Transmission System (ISTS)</b>  |               |               |              |
| <b>Transformation Capacity (MVA)</b>           | 1000          | 0             | 1000         |
| <b>Transmission Line (ckm)</b>                 | 280           | 0             | 280          |
| <b>Intra-State Transmission System (InSTS)</b> |               |               |              |
| <b>Transformation Capacity (MVA)</b>           | 0             | 2560          | 2560         |
| <b>Transmission line (ckm)</b>                 | 0             | 1169          | 1169         |

## CHAPTER-1

### Power Scenario and Existing Transmission Network in Kerala

#### 1.1 Background

Kerala is located at the southwestern tip of the Indian subcontinent. Kerala lies between the Arabian Sea to the west and the Western Ghats to the east, covering a geographical area of 38,863 sq. km. The neighboring states are Tamil Nadu and Karnataka. The climate of Kerala is characterized by moderate temperatures, high humidity and seasonal monsoon rains, which contribute significantly to the state's agriculture, biodiversity and natural ecosystems.

The Resource Adequacy Plan (RAP) for the Intra-State Transmission System (InSTS) in Kerala aims to ensure the reliability and stability of the power grid in the State up to the year 2034-35. The primary objective is to assess and address the adequacy of transmission infrastructure, ensuring that it can meet the growing demand for electricity while incorporating renewable energy sources and optimizing existing resources. The document outlines the expected electricity demand, generation capacity and the requisite transmission infrastructure developments over the next decade. Resource Adequacy plan has been prepared indicating the transmission capacity required to be added in Kerala till the year 2034-35.

#### 1.2 Present Power Scenario in Kerala

##### 1.2.1 Installed Capacity

As on 31.03.2026, total installed capacity of Kerala is 3,221 MW comprising thermal generation of 536 MW, hydro generation of 2,284 MW and other RE sources of 400 MW.

Sector-wise break up of installed capacity is give as below and also shown in Fig. 1:

| Sector       | Thermal       | Hydro          | Renewable (wind & Solar) | Total          | Solar less than 1 MW |
|--------------|---------------|----------------|--------------------------|----------------|----------------------|
| State        | 159.96        | 2196.36        | 24.74                    | 2381.06        | 3.16                 |
| Private      | 17.00         | 88.06          | 283.60                   | 388.66         | 1909.17              |
| Central      | 359.58        | 0.00           | 92.00                    | 451.58         | 0.00                 |
| <b>Total</b> | <b>536.54</b> | <b>2284.42</b> | <b>400.34</b>            | <b>3221.30</b> | <b>1912.33</b>       |

The roof top Solar capacity less than 1 MW is 1,912 MW, which is not included in the total installed capacity.

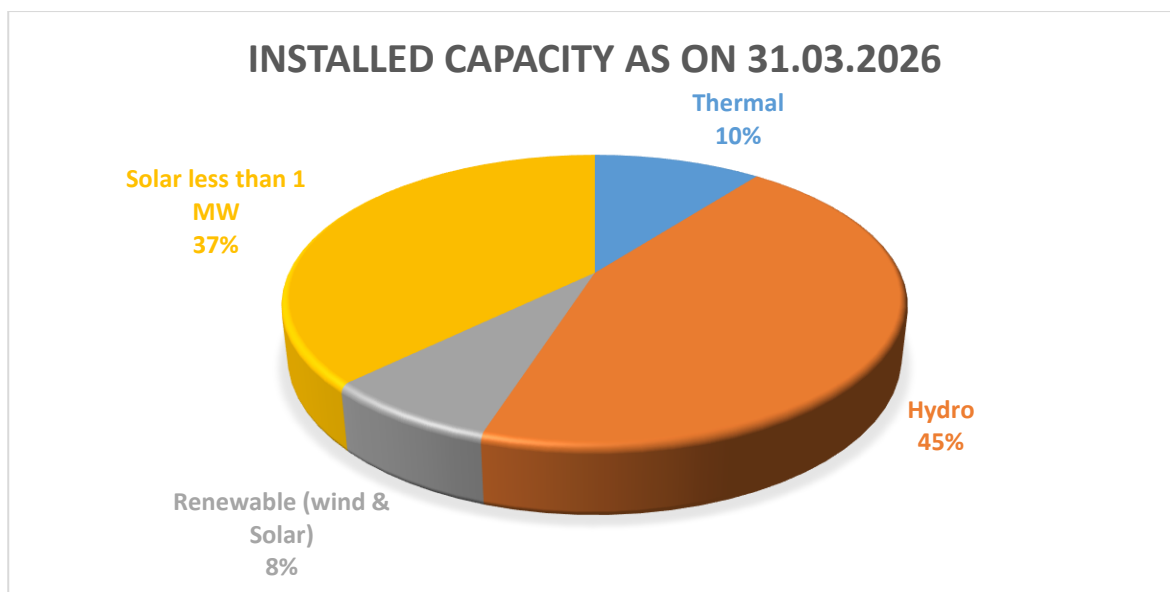


Fig.1 Installed capacity of Kerala as on 31.03.2026

### 1.2.2 Electricity Demand of Kerala

In May 2024, Kerala witnessed an all-time peak demand of 5,797 MW, about 9.35% higher than the 2023-24 peak of 5,301 MW. Further, on 25.03.2026, Kerala recorded a new peak demand of 5,836 MW, which is about 0.67% higher than the 2024-25 peak of 5,797 MW. Year-wise peak demand of Kerala is shown in Fig. 2.

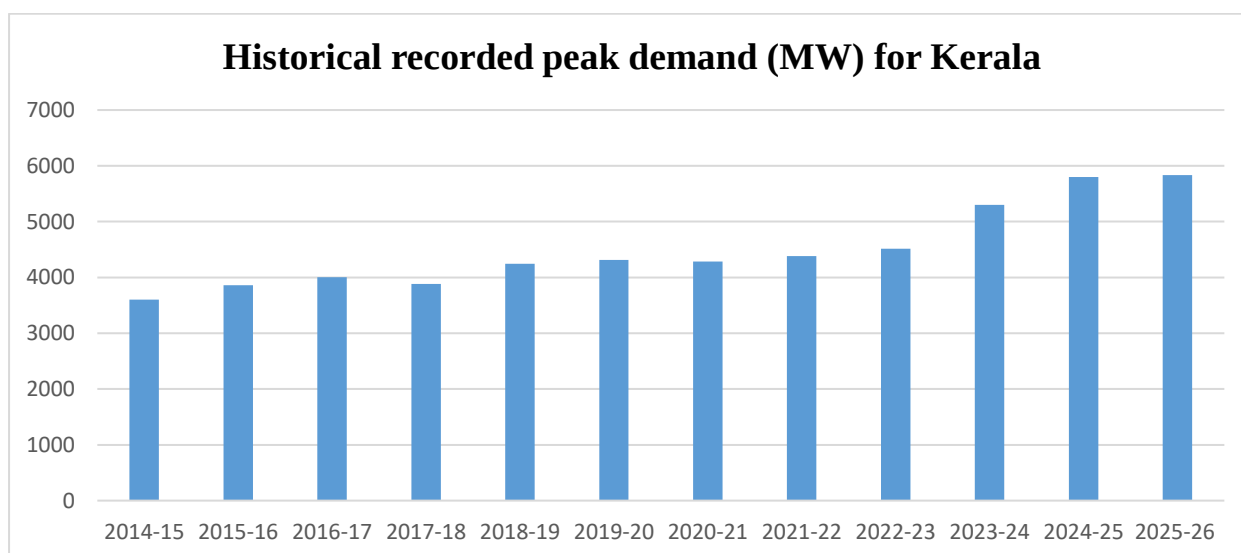


Fig.2 Year-wise peak demand of Kerala

Electricity demand in Kerala increased at an average rate of about 2.2% per annum during 2017–22 and 8.9% during 2022–24. During the year 2018-19 and 2023-24, demand increased sharply compared to previous years, influenced in part by Parliament and State Assembly election

periods. Apart from being an election year, year 2024 also experienced extreme summer heat and significantly low rainfall across Kerala and the entire Southern Region, contributing to higher electricity demand. Additionally, a rare solar flare phenomenon was observed during the year.

It is observed from the above graph that there is sustained growth in electricity demand driven by climatic conditions and rising consumption. Monthly variation of peak electricity demand for the year 2024-25 and 2025-26 is shown below:

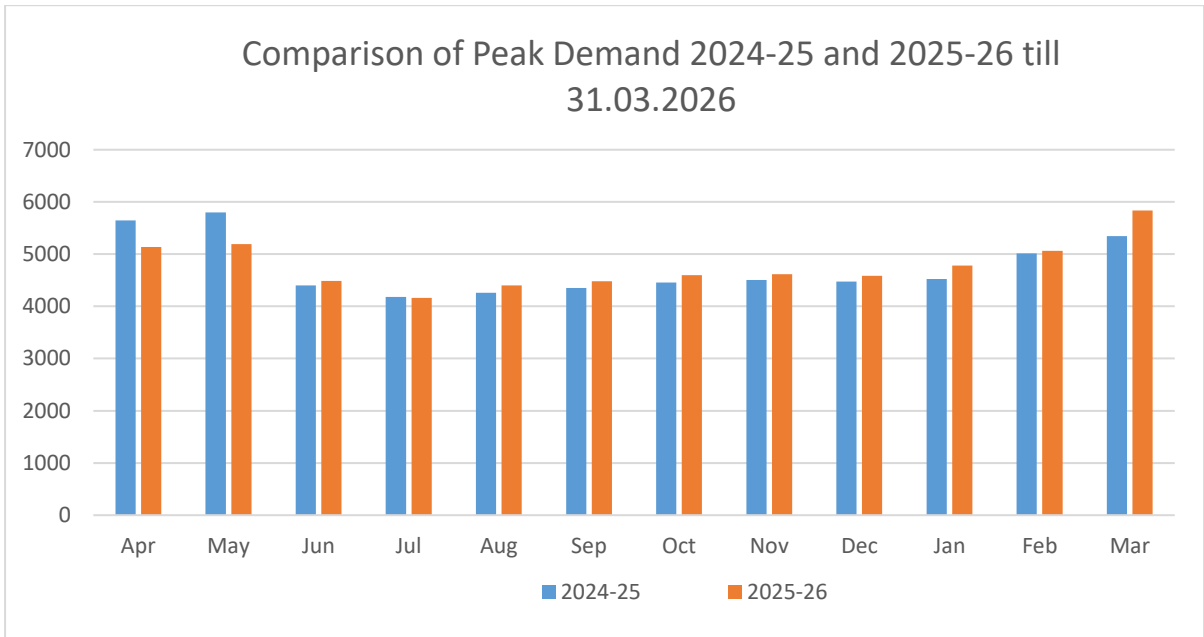


Fig.3 Comparison of Peak Demand 2024-25 and 2025-26

Monthly variation in the demand for a typical day in FY 2025-26 is given in Fig. 4. The graph shows how electricity demand changes throughout the day and across different months.

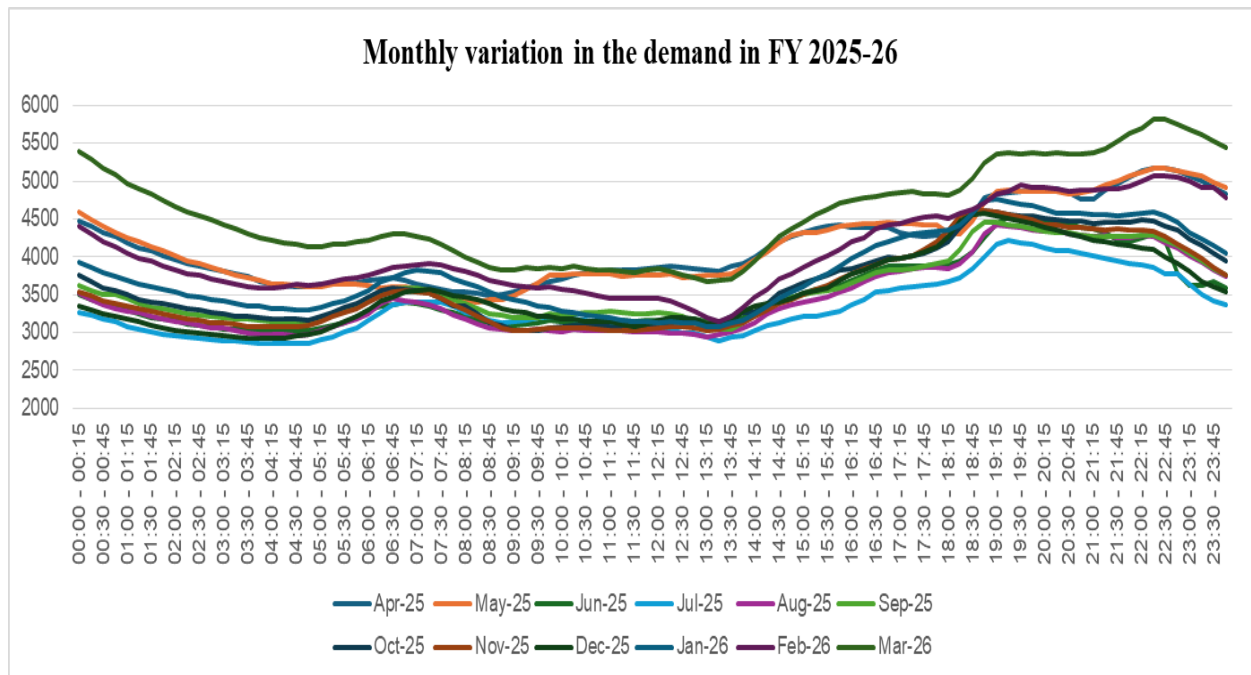


Fig.4 Monthly variation in Peak Demand in 2025-26

In all months, demand is lowest during early morning hours (00:00 to 05:00). It increases in the morning, remains fairly stable during midday and reaches its highest level in the evening (18:00 to 22:00). After this, demand decreases at night. From February-March onwards, the evening peak demand starts increasing and stays high up to May. The highest peak is seen in March with high demand continuing in April and May. The average demand is also higher in April, showing increased electricity use during the summer season.

During the monsoon months (June to September), demand is slightly lower. From October to January, demand remains moderate and stable. Overall, the graph shows that electricity demand is higher during summer months and lower during monsoon and winter periods, with evening hours being the peak demand time.

### 1.3 Existing Transmission System and Constraints in Transmission System

#### 1.3.1 Existing Transmission System

At present, Kerala has a total of eight (8) 400 kV stations, including one switching station at Trissur. Two (2) 400 kV substations are owned by KSEBL and six (6) owned by PGCIL. Details of existing ISTS and intrastate transmission system is given below:

**i. Details of existing Intra-State transformation capacity of Kerala:**

| S. No. | Voltage (kV) | Number of Substations | Transformation Capacity (MVA) |
|--------|--------------|-----------------------|-------------------------------|
| 1      | 400/220      | 2                     | 1575                          |
| 2      | 220/110      | 34                    | 9620                          |
| 3      | 220/66       |                       | 276                           |
| 4      | 220/33       |                       | 250                           |
| 5      | 110/66       | 187                   | 2210                          |
| 6      | 110/33       |                       | 2556                          |
| 7      | 110/22       |                       | 160                           |
| 8      | 110/11       |                       | 6215                          |
| 9      | 66/33        | 47                    | 92                            |
| 10     | 66/11        |                       | 1543                          |
|        | Total        |                       | 24.497                        |

Two 400 kV Intra-state substations are Madakkathara and Kottayam substations.

**ii. Details of existing Intra-State Transmission lines in Kerala:**

| S. No. | Voltage (kV) | Transmission Line (ckm) (including Cable) |
|--------|--------------|-------------------------------------------|
| 1      | 400          | 178.26                                    |
| 2      | 220          | 3202.17                                   |
| 3      | 110          | 5709.1                                    |
| 4      | 66           | 1472.303                                  |
|        | <b>Total</b> | <b>10561.83</b>                           |

**iii. Details of ISTS substations in Kerala:**

| SI. No. | Sub station             | Voltage (kV) | Capacity (MVA)           |
|---------|-------------------------|--------------|--------------------------|
| 1.      | Kozhikode               | 400/220      | 500+2x315=1130           |
| 2.      | HVDC Thrissur           | 400/220      | 2x315=630                |
| 3.      | Thrissur North          | 400          | 400 kV switching station |
| 4.      | Kochi                   | 400/220      | 2x315+500=1130           |
| 5.      | Elappully (Palakkad)    | 400/220      | 2x315+500=1130           |
| 6.      | Pallipuram (Trivandrum) | 400/220      | 3x315=945                |
|         |                         | <b>Total</b> | <b>4965</b>              |

**iv. Details of ISTS lines in Kerala:**

| S. No. | Voltage (kV)  | ckm            |
|--------|---------------|----------------|
| 1      | 400 kV        | 1271.14        |
| 2      | 320 kV (HVDC) | 130.34         |
| 3      | 220 kV        | 412.39         |
|        |               | <b>1813.87</b> |

**v. Kerala is connected to the neighboring states viz Karnataka and Tamil Nadu. The details are given as under:**

| S. No. | Transmission lines                              | Connecting state | Voltage (kV) | Capacity (MW) | ckm                                            | Owned by     |
|--------|-------------------------------------------------|------------------|--------------|---------------|------------------------------------------------|--------------|
| 1      | Thirunelveli – Trivandrum 400 kV D/C line       | Tamil Nadu       | 400          | 2217          | 320 (149.8 in Kerala)                          | PGCIL        |
| 2      | Thirunelveli - Kottayam - Kochi 400 kV D/c line | Tamil Nadu       | 400          | 4434          | 334.5 (1.23 KSEBL owned)                       | PGCIL        |
| 3      | Udumalpet – Palakkad 400 kV D/c line            | Tamil Nadu       | 400          | 2217          | 191.4 (96.2 in Kerala)                         | PGCIL        |
| 4      | Mysore –Kozhikkode 400 kV D/c line              | Karnataka        | 400          | 2217          | 412 (284 in Kerala)                            | PGCIL        |
| 5      | HVDC Pugalur – Trichur D/c line                 | Tamil Nadu       | 320          | 2000          | 132.73 (5.44 UG + 127.28 OH in Kerala)         | PGCIL        |
| 6      | Thirunelveli – Edamon 220 kV D/c line           | Tamil Nadu       | 220          | 1219          | 162 (20 in Kerala)                             | PGCIL        |
| 7      | Kaniyampetta – Kadakola 220 kV S/c line         | Karnataka        | 220          | 277           | 102.69 (21.69 in Kerala)                       | KSEBL+ KPTCL |
| 8      | Sabarigiri –Theni 220 kV S/c line               | Tamil Nadu       | 220          | 277           | 106.5 (44.58 in Kerala)                        | KSEBL+ TNEB  |
| 9      | Udumalpet – Pallivasal 220 kV S/c line          | Tamil Nadu       | 220          | 277           | 71.62 (44.42 in Kerala+ 27.2 km in Tamil Nadu) | KSEBL+ TNEB  |

**vi. ATC/TTC**

At present the TTC of Kerala system is 4,575 MW and the Available transfer capability/ import capability of the system is 4,455 MW.

**vii.      Islanding Schemes:**

To prevent a cascading grid failure by creating a self-sustaining "island" with local generation (thermal/hydro/gas) to feed critical infrastructure and as part of resilience planning, the major cities in Kerala are included in the Kudankulam and Neyveli islanding schemes. The Kudankulam islanding scheme covers the south and central part of Kerala from Thiruvananthapuram to Ernakulam district and the Neyveli islanding scheme covers Trissur and Palakkadu district. The overall objective is to support growing urban demand, improve reliability indices, facilitate renewable integration and ensure continuity of essential services even under contingency conditions.

**viii.     Special Protection Scheme (SPS):**

Special Protection Schemes (SPS) are automated, pre-determined control actions designed to maintain grid stability and prevent wide-area blackouts during severe contingencies, such as generator outages or line overloads. These schemes manage frequency and voltage instability, often initiating, for example, automatic generator tripping or load shedding, when system security is threatened. Following special protection scheme are implemented in Kerala system.

- a) For Kudankulam power station Unit-1 &2.
- b) For Raigarh-Pugalur SPS Load Relief RP-1 & 2 signal (Load Grouping for System Protection Schemes for HVDC Raigarh Pugalur-1 & 2)

**ix.   Power Map of Kerala:**

The power map of Kerala depicting all existing inter-state and intra-state substations and connecting transmission lines (220 kV and above voltage level) is given below:

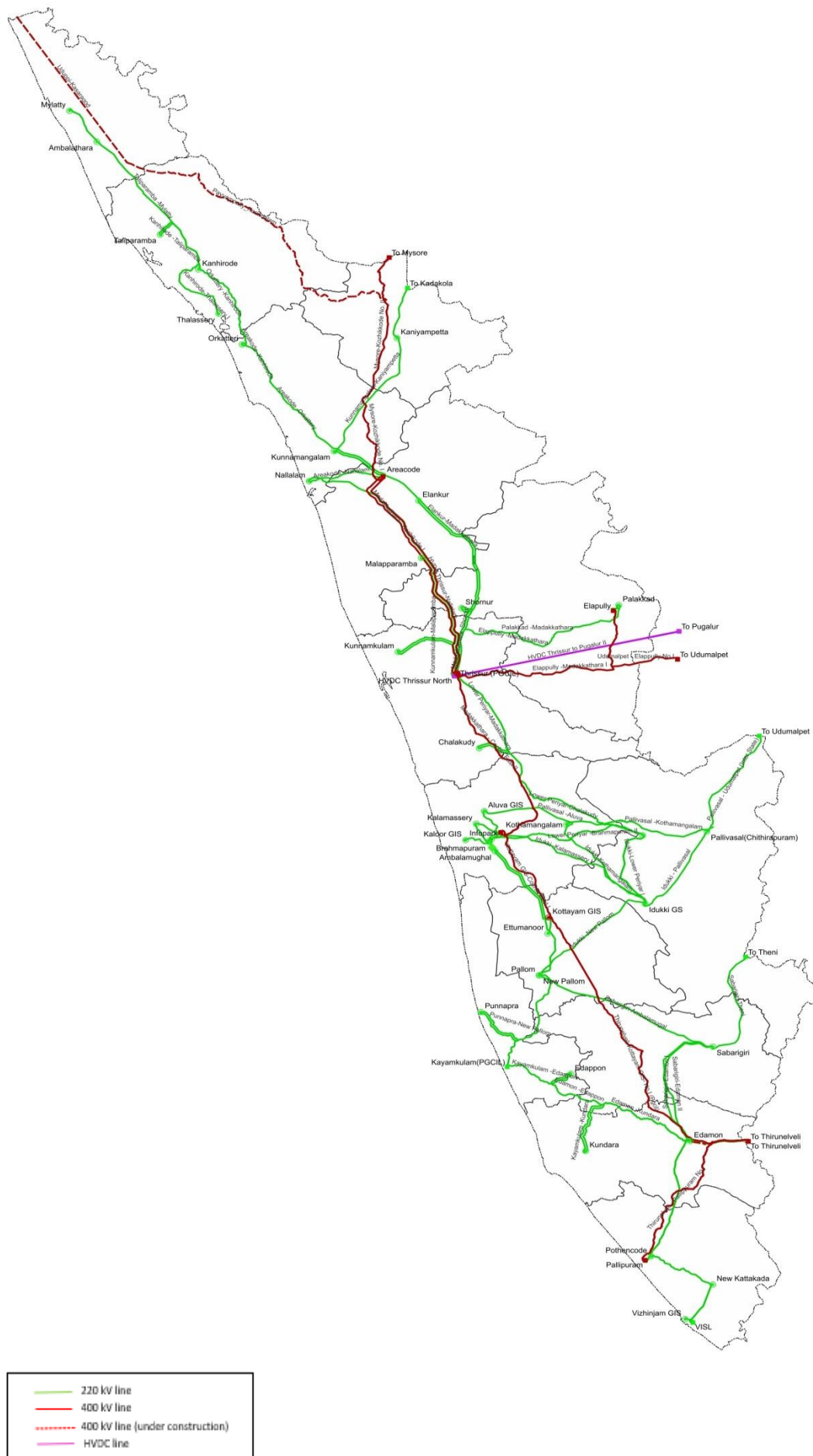


Fig.5 Power Map of Kerala with existing transmission system

### 1.3.2 Constraints in the existing Transmission System

Constraints in Transmission System in Kerala occur during peak demand scenarios. Details of present constraints in Transmission System in Kerala is given below:

#### **Constraints in ICTs:**

| S. No. | Constraints                                                                                     | Remedial Measures                                                                                                                                       | Status                                                      |
|--------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1      | 400/220 kV Kozhikode ICTs (2x315MVA+ 1x500MVA)                                                  | Additional 4 <sup>th</sup> 500 MVA ICT at Kozhikode is already planned.                                                                                 | Scheduled to be commissioned by Feb, 2027.                  |
| 2      | 400/220 kV Trichur HVDC (2x315MVA)                                                              | Additional 3 <sup>rd</sup> ICT at Trichur HVDC is already planned.                                                                                      | Scheduled to be commissioned by Aug, 2027.                  |
| 3      | KSEBL/KPTCL Import of S3                                                                        | 400 kV UPCL - Kasargode - Wayanad                                                                                                                       | UPCL - Kasargode scheduled to be commissioned by Aug, 2026. |
| 4      | 220kV S/s Shoranur Transformer:<br>200MVA+ 100MVA:                                              | Additional 200MVA proposed in 2026. Split bus operation and load re-arrangement at 110kV side for availing support from Madakkathara SS for time being. | Scheduled to be commissioned in 2026-27                     |
| 5      | 220kV S/s Nallalam Transformer: 200MVA X 2: 70% loading observed with maximum Kuttiady support. | Additional 1X200MVA, 220/110kV transformer                                                                                                              | Scheduled to be commissioned by 2027-28                     |
| 6      | 220kV S/s Kunnamangalam: 100MVA x2: 70% loading observed with                                   | Additional 1X100MVA 220/110kV                                                                                                                           | Scheduled to be commissioned by 2027-28                     |

| S. No. | Constraints                                                                                                                                         | Remedial Measures                                                                                                       | Status                                                  |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
|        | maximum Kuttiady support                                                                                                                            |                                                                                                                         |                                                         |
| 7      | 220kV S/s Malaparamba: 200MVA+ 100MVA: 80% loading observed even after shifting the load to Shoranur SS.                                            | Capacity enhancement of 1X100MVA, 220/110kV transformer to 1X200MVA                                                     | Scheduled to be commissioned in 2026-27                 |
| 8      | 220kV s/s Areakode: 160MVA: More than 60% loading.                                                                                                  | To be proposed in 2029-30                                                                                               | Scheduled to be commissioned by 2029-30                 |
| 9      | 220kV S/s Elankur: 2x100MVA: 65% loading.                                                                                                           | To be proposed in 2029-30                                                                                               | Scheduled to be commissioned by 2029-30                 |
| 10     | 220kV S/s Kalamassery: 110/66kV 63x2MVA: More than 85% loading: Split bus and load re arrangement at 66kV level done to avail support from Aluva SS | Proposal for upgradation of 66kV S/s Njarakkal , Panampally Nagar, Marine drive and Perumanoor to 110 kV under progress | under progress, scheduled to be commissioned in 2026-27 |
| 11     | 220 kV S/s Edamon: 1x200MVA: 68% loading                                                                                                            | Proposal for a new 200MVA 220/110kV transformer in 2027-28                                                              | Scheduled to be commissioned by 2027-28                 |
| 12     | 220kV Substation Pallom                                                                                                                             | Additional 1X200MVA, 220/110kV transformer proposed in 27-28                                                            | Scheduled to be commissioned by 2027-28                 |
| 13     | 220kV Substation Brahmapuram                                                                                                                        | Additional 1X200MVA, 220/110kV transformer proposed in 26-27                                                            | Scheduled to be commissioned by 2026-27                 |

| S. No. | Constraints                                        | Remedial Measures                                            | Status                                  |
|--------|----------------------------------------------------|--------------------------------------------------------------|-----------------------------------------|
| 14     | 220kV Substation Palakkadu.                        | Additional 1X200MVA, 220/110kV transformer proposed in 27-28 | Scheduled to be commissioned by 2027-28 |
| 15     | 220kV s/s Areakode: 160MVA: More than 60% loading. | To be proposed in 2029-30                                    | Scheduled to be commissioned by 2029-30 |
| 16     | 220kV Substation Kaniyampetta                      | Upgradation to 100MVA 220/110/11kV                           | Scheduled to be commissioned by 2029-30 |
| 17     | 220kV Substation Ettumanoor                        | Additional 1X200MVA, 220/110kV transformer proposed in 29-30 | Scheduled to be commissioned by 2029-30 |
| 18     | 400kV Substation Madakkathara                      | Additional 1X200MVA, 220/110kV transformer proposed in 29-30 | Scheduled to be commissioned by 2029-30 |
| 19     | 220kV Substation Pothencode                        | Additional 1X200MVA, 220/110kV transformer proposed in 34-35 | Scheduled to be commissioned by 2034-35 |
| 20     | 220kV Substation Kundara                           | Additional 1X200MVA, 220/110kV transformer proposed in 34-35 | Scheduled to be commissioned by 2034-35 |
| 21     | 220kV Substation Kaloor                            | Additional 1X200MVA, 220/110kV transformer proposed in 34-35 | Scheduled to be commissioned by 2034-35 |

#### **Constraints in Transmission Lines:**

| S. No. | Constraints                          | Remedial Measures                                                                                     | Status                                                  |
|--------|--------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| 1      | Areakode-Kanhirode 220 kV S/c line   | With the commissioning of 400kV Kasargode and downstream network these constraints would be resolved. | Under Construction and would be commissioned in 2026-27 |
| 2      | Areacode- Orkkattery 220 kV S/c line |                                                                                                       |                                                         |

| S. No. | Constraints                                                       | Remedial Measures                                                                                                                                                                                                                    | Status                                  |
|--------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 3      | Areakode – Kunnamangalam 220 kV S/c                               |                                                                                                                                                                                                                                      |                                         |
| 4      | 220 kV Areakode - Kozhikode 1,2 & 3                               | Bus Strengthening work as well as Pantograph Isolator replacement work at Areakkode end completed. CT ratio changed at both end. Also 4 <sup>th</sup> feeder from Kozhikode PGCIL substation proposed along with 4 <sup>th</sup> ICT | Scheduled to be commissioned by 2027-28 |
| 5      | 220 kV Madakkathara Shornur                                       | With the commissioning of 400kV Kasargode and downstream network these constraints would be resolved                                                                                                                                 | Scheduled to be commissioned by 2027-28 |
| 6      | 110 kV Brahmapuram Kadavanthra                                    | Reconductoring with HTLS proposed                                                                                                                                                                                                    | Scheduled to be commissioned by 2027-28 |
| 7      | 110 kV Kakkayam Chakkittappara & Kakkayam Kuttiady Feeders        | Reconductoring with HTLS to be done                                                                                                                                                                                                  | Scheduled to be commissioned by 2027-28 |
| 8      | 110 kV Mylatty Vidyanagar                                         | Conversion to DC under progress                                                                                                                                                                                                      | Scheduled to be commissioned by 2026-27 |
|        | 110 kV Kalamassery Edayar 1&2 Feeders                             | Proposed the upgradation of 66kV Aluva - Edayar Feeder                                                                                                                                                                               | Scheduled to be commissioned by 2028-29 |
| 9      | 110 kV Palakkad Vennakkara 1&2 Feeders                            | Uprating of 110kV Palakkad – Vennakkara Double Circuit feeders from 220kV S/s Palakkad to 110kV Substation Vennakkara with AL 59 conductor.                                                                                          | Scheduled to be commissioned by 2028-29 |
| 10     | 110 kV Vennakkara Malampuzha Feeder                               | Planned doubling with Single Panther conductor for congestion removal.                                                                                                                                                               | Scheduled to be commissioned by 2027-28 |
| 11     | 110 kV Shornur - Koottanad ,110 kV Shornur -Arangottukara Feeders | Reconductoring of 110kV Shornur – Koppam and 110kV Shornur – Arangottukkara with AL 59 conductors proposed                                                                                                                           | Scheduled to be commissioned by 2028-29 |

## Chapter-2

### Transmission System Requirement by 2029-30

#### 2.1 Scope of Load flow studies:

System studies for the resource adequacy plan for Kerala's InSTS have been carried out using PSSE Software. The studies include the following:

- (i) Steady state load flow studies
- (ii) Contingency Analysis
- (iii) Short Circuit Studies

Peak electricity demand in Kerala occurs in summer season during the months of March to May. Also, during this time, solar power injection remains high in the day time. The load flow studies have been carried out for peak electricity demand scenario which occurs during the evening time of month of March to May for the time frame 2029-30 with following considerations:

- (i) Load power factor has been considered within  $\pm 0.95$  as per the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019.
- (ii) 'N-1' criterion has been considered as recommended in the CEA (Manual on Transmission Planning Criteria), 2023.
- (iii) Transformation capacity of the substations have been considered as per the CEA (Manual on Transmission Planning Criteria), 2023.
- (iv) The system voltage has been considered within the following limits as per the CEA (Manual on Transmission Planning Criteria), 2023:

|        |                        |
|--------|------------------------|
| 220 kV | Max 245 kV, Min 198 kV |
| 400 kV | Max 420 kV, Min 380 kV |
| 765 kV | Max 800 kV, Min 728 kV |

- (v) Under implementation/ planned transmission schemes in Kerala to be commissioned by 2029-30 have been considered in the studies.
- (vi) The availability factor of the generators located in Kerala state is considered as given below:

|             | Gas | Hydro | Solar | Wind |
|-------------|-----|-------|-------|------|
| March Night | 0 % | 75 %  | 0 %   | 80 % |

## 2.2 Load flow studies for the year 2029-30:

### 2.2.1 Addition in the generation of Kerala by the year 2029-30

Around 120 MW Hydro is expected to be commissioned by 2029-30. Details of addition in generation from year 2025-26 to 2029-30 is given below:

| Sl. No. | Name of Project       | Installed Capacity (MW) | Expected year of Commission |
|---------|-----------------------|-------------------------|-----------------------------|
| 1       | Poovaramthode SHP     | 3                       | 2026-27                     |
| 2       | Olikkal SHP           | 5                       | 2026-27                     |
| 3       | Chinnar SHP           | 24                      | 2027-28                     |
| 4       | Upper Sengulam        | 24                      | 2028-29                     |
| 5       | Mankulam Stage-I      | 40                      | 2028-29                     |
| 6       | Poringalkuth Stage-II | 24                      | 2029-30                     |
|         | <b>Total</b>          | <b>120</b>              |                             |

Further, around 300 MW of wind generation capacity and 1,200 MW of solar generation including rooftop capacity have also been planned to be added in Kerala along with 800 MW of Battery Energy Storage system (BESS) by 2029-30.

### 2.2.2 Demand Projection of Kerala by the year 2029-30

Peak electricity demand of Kerala in 2029-30 as per revised 20th EPS projections is 6,752 MW, however, as per KSEBL, the same is 7,916 MW, which is on higher side as compared to EPS projections. Peak electricity demand of 7,916 MW has been considered for the studies as projected by KSEBL.

### 2.2.3 LGB for 2029-30

| Peak LGB for 2029-30 in MW     |             |
|--------------------------------|-------------|
| <b>Demand in MW</b>            | <b>7916</b> |
| <b>Availability (Existing)</b> |             |
| Hydro                          | 1700        |
| CGS                            | 1600        |
| LTA                            | 600         |
| MTOA                           | 80          |
| REMC                           | 20          |
| <b>Availability (proposed)</b> |             |
| Hydro                          | 120         |
| Wind                           | 300         |

|                                                  |             |
|--------------------------------------------------|-------------|
| BESS                                             | 800         |
| <b>Total Availability</b>                        | <b>5220</b> |
| <b>Additional import expected during 2029-30</b> | <b>2696</b> |

### 2.3 Transmission schemes to be added under intra-state during 2026-30

Intra-state transmission system under implementation/planned to be commissioned by 2029-30 are given below:

#### a) New Substations:

| S. No.       | Name of Sub-station    | Voltage (kV) | Number of ICTx Capacity of ICT | MVA         | Status (Under Construction/Planned) | Anticipated date of Commissioning |
|--------------|------------------------|--------------|--------------------------------|-------------|-------------------------------------|-----------------------------------|
| 1.           | Wayanad                | 400          | 2x500                          | 1000        | Under Construction                  | 2028-29                           |
| 2.           | Edamon                 | 400          | 3x500                          | 1500        | Under Construction                  | 2029-30                           |
| 3.           | Kakkad                 | 220          | 1x100                          | 100         | Under Construction                  | 2026-27                           |
| 4.           | Vengallore             | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 5.           | Thuravoor              | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 6.           | Vidyanagar (Kasaragod) | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 7.           | Vennakkara             | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 8.           | Agali                  | 220          | 2x100                          | 200         | Bidding Stage                       | 2027-28                           |
| 9.           | Mannarkkad             | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 10.          | Irinjalakuda           | 220          | 2x200                          | 400         | Planned                             | 2027-28                           |
| 11.          | Nirmala City           | 220          | 2x200                          | 400         | Bidding Stage                       | 2027-28                           |
| 12.          | Sasthamkotta           | 220          | 2x200                          | 400         | Planned                             | 2027-28                           |
| <b>Total</b> |                        |              |                                | <b>6000</b> |                                     |                                   |

#### b) Augmentation of sub-stations:

| S. No. | Substation | Voltage Level | Exiting Capacity in MVA | Additional Capacity in MVA | Anticipated Date of Commissioning |
|--------|------------|---------------|-------------------------|----------------------------|-----------------------------------|
| 1.     | Kottayam   | 400           | 2x315                   | 500                        | 2029-30                           |
| 2.     | Edamon     | 220           | 1x200                   | 200                        | 2027-28                           |

|              |               |     |             |             |         |
|--------------|---------------|-----|-------------|-------------|---------|
| 3.           | Pallom        | 220 | 2x200       | 200         | 2027-28 |
| 4.           | Ettumannor    | 220 | 1x100       | 200         | 2029-30 |
| 5.           | Brahmapuram   | 220 | 2x160       | 200         | 2027-28 |
| 6.           | Madakkathara  | 220 | 3x200       | 200         | 2029-30 |
| 7.           | Malapparamba  | 220 | 1x100+1x200 | 200         | 2027-28 |
| 8.           | Nallalam      | 220 | 2x200       | 200         | 2027-28 |
| 9.           | Shornur       | 220 | 2x100       | 200         | 2027-28 |
| 10.          | Palakkad      | 220 | 3x160       | 200         | 2027-28 |
| 11.          | Kunnamangalam | 220 | 2x100       | 100         | 2027-28 |
| 12.          | Kaniyampetta  | 220 | 3x50        | 100         | 2028-29 |
| <b>Total</b> |               |     |             | <b>2500</b> |         |

**c) Transmission lines:**

| S. No | Transmission Line                                                                                                                    | Voltage (kV) | No. of circuits | Ckm | Anticipated Date of Commissioning |
|-------|--------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|-----|-----------------------------------|
| 1.    | Charging of Tirunelveli - Edmon D/c line to its rated voltage 400 kV presently charged at 220 kV                                     | 400          | 2               | -   | 2028-29                           |
| 2.    | LILO of one circuit of Tirunelveli – Kottayam 400 kV D/c line at Edmon                                                               | 400          | 2               | 20  | 2028-29                           |
| 3.    | Kunnamkulam-Vengallor 220 kV D/c line                                                                                                | 220          | 2               | 84  | 2027-28                           |
| 4.    | LILO of Kundara- Kayamkulam 220 kV S/c line at Sasthamkotta                                                                          | 220          | 2               | 13  | 2027-28                           |
| 5.    | Aluva – Irinjalakkuda 220 kV D/c line                                                                                                | 220          | 2               | 60  | 2028-29                           |
| 6.    | LILO of Madakkathara- Palakkad 220 kV S/c line at Vennakkara                                                                         | 220          | 2               | 15  | 2027-28                           |
| 7.    | LILO of both circuits Kanhirode-Mylatty line 220 kV D/c line at Kasaragode S/s                                                       | 220          | 4               | 34  | 2026-27                           |
| 8.    | Rammakkallmedu Green Corridor (RGC) -LILO of Idukki-Pallivasal 220 kV D/c line at Nirmala city                                       | 220          | 2               | 40  | 2027-28                           |
| 9.    | Attappady Green Corridor (AGC)-LILO of Madakkathara- Areekode 220kV S/c line at Mannarkad and Mannarkad – Kottathara 220 kV D/c line | 220          | 2               | 106 | 2027-28                           |
| 10.   | Iringalakkuda-Kunnamkulam 220 kV D/c line                                                                                            | 220          | 2               | 40  | 2028-29                           |
| 11.   | Mannarkad-Vennakkara 220 kV D/C line                                                                                                 | 220          | 2               | 80  | 2029-30                           |

### Summary of Intra-State Transmission System to be added during 2026-30:

| Voltage Level                 | 400 kV | 220 kV | Total |
|-------------------------------|--------|--------|-------|
| Transformation Capacity (MVA) | 3000   | 5500   | 8500  |
| Transmission line (ckm)       | 20     | 472    | 492   |

### 2.4 Transmission schemes to be added under inter-state during 2026-30

ISTS schemes under implementation/planned to be commissioned by 2029-30 are given below:

| S. No.       | Transmission scheme                                                     | Voltage (kV) | ckm | MVA  | Present Status     | Anticipated Commissioning |
|--------------|-------------------------------------------------------------------------|--------------|-----|------|--------------------|---------------------------|
| <b>1.</b>    | <b>Mangalore (UPCL)-Kasargode-Wayanad 400 kV line</b>                   |              |     |      |                    |                           |
| <b>(i)</b>   | Mangalore (UPCL)-Kasargode 400 kV D/c line                              | 400 kV       | 220 | -    | Under Construction | 2026-27                   |
| <b>(ii)</b>  | Establishment of 2x500 MVA, 400/220 kV GIS substation at Kasargode      | 400/220 kV   | -   | 1000 | Under Construction | 2026-27                   |
| <b>(iii)</b> | Wayanad- Kasargod 400 kV D/c line                                       | 400 kV       | 250 | -    | Under Construction | 2026-27                   |
| <b>(iv)</b>  | LILO of both circuit Mysore – Kozikode 400 kV D/c line at Wayanad       | 400 kV       | 4   | -    | Under Construction | 2026-27                   |
| <b>2.</b>    | <b>Augmentation of ICT:</b>                                             |              |     |      |                    |                           |
| <b>(i)</b>   | Additional 400/220kV, 1x500 MVA ICT (3 <sup>rd</sup> ) at Thrissur HVDC | 400/220 kV   | -   | 500  | Planned            | 2026-27                   |
| <b>(ii)</b>  | Additional 400/220kV, 1x500 MVA ICT (4 <sup>th</sup> ) at Kozhikode     | 400/220 kV   | -   | 500  | Planned            | 2026-27                   |
| <b>(iii)</b> | Additional 400/220kV, 1x500 MVA ICT (4 <sup>th</sup> ) at Trivandrum    | 400/220 kV   | -   | 500  | Planned            | 2027-28                   |

**Summary of Inter-State Transmission Network to be added during 2026-30:**

|                                      |               |
|--------------------------------------|---------------|
| <b>Voltage Level</b>                 | <b>400 kV</b> |
| <b>Transformation Capacity (MVA)</b> | 2500          |
| <b>Transmission Line (ckm)</b>       | 474           |

### Chapter-3

#### Transmission System Requirement by 2034-35

#### 3.1 Load flow studies

##### 3.1.1 Likely Installed Capacity by 2034-35:

| Sl. No. | Name of Project                | Capacity (MW) | Expected year of Commissioning |
|---------|--------------------------------|---------------|--------------------------------|
| 1       | Letchmi HEP                    | 240           | 2034-35                        |
| 2       | Mankulam Stage-II              | 40            | 2032-33                        |
| 3       | Idamalayar Extension           | 80            | 2032-33                        |
| 4       | Idukki Extension               | 520           | 2034-35                        |
|         | <b>Pumped Storage Projects</b> |               |                                |
| 1       | Mudirapuzha PSP                | 100           | 2032-33                        |
| 2       | Kakkayam PSP                   | 800           | 2034-35                        |
| 3       | Poringalkuth PSP               | 400           | 2034-35                        |
| 4       | Upper Chaliyar                 | 360           | 2034-35                        |
|         | <b>Total</b>                   | <b>2540</b>   |                                |

Further, wind and solar generation capacity have also been planned to be added in Kerala along with Battery Energy Storage system (BESS). Likely installed generation capacity considered in Kerala by the year 2034-35 for planning of transmission system is given below:

##### Likely Installed Generation Capacity by 2034-35 in Kerala

(figures in MW)

| Thermal | Gas | Hydro | PSP  | Nuclear | Wind | Solar including roof top | Biomass | Total        | BESS |
|---------|-----|-------|------|---------|------|--------------------------|---------|--------------|------|
| 537     | 0   | 3284  | 1660 | 0       | 372  | 5187                     | 0       | <b>11040</b> | 800  |

All the above are planned generation planned to be connected to InSTS network.

##### 3.1.2 Peak electricity demand of Kerala in 2034-35

(i) The year-wise projected demand of Kerala is given below:

### Peak electricity demand of Kerala projections

| Sl. No. | Year    | Projected peak electricity demand (MW) |
|---------|---------|----------------------------------------|
| 1.      | 2030-31 | 8255                                   |
| 2.      | 2031-32 | 8579                                   |
| 3.      | 2032-33 | 8971                                   |
| 4.      | 2033-34 | 9363                                   |
| 5.      | 2034-35 | 9780                                   |

#### 3.1.3 LGB for the year 2034-35:

| Peak LGB for 2034-35 in MW                       |             |
|--------------------------------------------------|-------------|
| <b>Demand in MW</b>                              | <b>9780</b> |
| <b>Availability (Existing)</b>                   |             |
| Hydro                                            | 1700        |
| CGS                                              | 1600        |
| LTA                                              | 600         |
| MTOA                                             | 80          |
| REMC                                             | 20          |
| <b>Availability (proposed in 29-30)</b>          |             |
| Hydro                                            | 120         |
| Wind                                             | 300         |
| BESS                                             | 800         |
| <b>Availability (proposed in 34-35)</b>          |             |
| Hydro                                            | 880         |
| PSP                                              | 1660        |
| <b>Total Availability for 2034-35</b>            | <b>7760</b> |
| <b>Additional import expected during 2034-35</b> | <b>2020</b> |

#### 3.1.4 Considerations for Load flow studies for the year 2034-35:

- (i) The load flow studies have been carried out for the peak electricity demand scenario which occurs during the evening hours of summer season in the month of March/April/May depending on the onset of the southwest monsoon.

(ii) For the studies of peak demand scenario of 2034-35, the transmission elements (new lines/ reconductoring of the existing lines and new substations/ ICT augmentations) already planned by KSEB Ltd. to be added by 2034-35 have been considered.

### 3.2 Transmission schemes to be added under intra-state during 2030-35

Intra-state transmission system under implementation/planned to be commissioned during 2030-35 are given below:

#### a) Sub-stations:

| S. No.       | Name of sub-station | Voltage (kV) | Capacity (MVA) | Anticipated Date of Commissioning |
|--------------|---------------------|--------------|----------------|-----------------------------------|
| 1.           | Kakkayam            | 220          | 2x200          | 2034-35                           |
| 2.           | Viyyur              | 220          | 2x200          | 2030-31                           |
| 3.           | Paruthippara        | 220          | 2x200          | 2030-31                           |
| 4.           | Pazhayannur         | 220          | 2x200          | 2030-31                           |
| 5.           | Thodupuzha          | 220          | 2x200          | 2030-31                           |
| <b>Total</b> |                     |              | <b>2000</b>    |                                   |

#### b) Augmentation of Sub-stations:

| S. No.       | Substation | Voltage Level | Exiting Capacity in MVA | Add Capacity in MVA | Anticipated Date of Commissioning |
|--------------|------------|---------------|-------------------------|---------------------|-----------------------------------|
| 1            | Pothencode | 220           | 3x200                   | 200                 | 2034-35                           |
| 2            | Kundara    | 220           | 2x200                   | 200                 | 2034-35                           |
| 3            | Kaloor     | 220           | 2x160                   | 160                 | 2034-35                           |
| <b>Total</b> |            |               |                         | <b>560</b>          |                                   |

#### c) Transmission Lines:

| S. No. | Transmission Line                     | Voltage (kV) | No. of circuits | Ckm | Anticipated Date of Commissioning |
|--------|---------------------------------------|--------------|-----------------|-----|-----------------------------------|
| 1      | Kunnamangalam – Kakkayam – Thalassery | 220          | D/c             | 200 | 2034-35                           |
| 2      | Balaramapuram – Paruthippara          | 220          | D/c             | 25  | 2034-35                           |
| 3      | Balaramapuram- Vizhinjam              | 220          | D/c             | 10  | 2034-35                           |
| 4      | Balaramapuram- New Kattakkada         | 220          | D/c             | 10  | 2034-35                           |

|    |                                               |     |     |     |         |
|----|-----------------------------------------------|-----|-----|-----|---------|
| 5  | Areacode – Pakkam 220kV SC to DC              | 220 | D/c | 176 | 2034-35 |
| 6  | Idukki Extn – New Pallom                      | 220 | D/c | 100 | 2034-35 |
| 7  | Idukki Extn – Kottayam LILO                   | 220 | D/c | 100 | 2034-35 |
| 8  | Idukki Extn – Kothamangalam 220kV SC to DC    | 220 | D/c | 82  | 2034-35 |
| 9  | Idukki – Udumal 220kV SC to DC                | 220 | D/c | 170 | 2034-35 |
| 10 | 220kV Viyyur to Shornur double circuit feeder | 220 | D/c | 32  | 2030-31 |
| 11 | 220kV HVDC Trissur-Viyyur                     | 220 | D/c | 12  | 2030-31 |
| 12 | 220kV Edamon-Paruthippara                     | 220 | S/c | 53  | 2030-31 |
| 13 | 220kV Pothencode – Paruthippara               | 220 | D/c | 11  | 2030-31 |
| 14 | 220kV TVPM PGCIL-Paruthippara                 | 220 | S/c | 12  | 2030-31 |
| 15 | 220kV Vennakkara-Pazhayannur                  | 220 | S/c | 40  | 2030-31 |
| 16 | 220kV Palakkad-Pazhayannur                    | 220 | S/c | 58  | 2030-31 |
| 17 | 220kV Madakkathara-Pazhayannur                | 220 | D/c | 34  | 2030-31 |
| 18 | 220kV Idukki- Thodupuzha                      | 220 | S/c | 21  | 2030-31 |
| 19 | 220kV Kothamangalam-Thodupuzha                | 220 | S/c | 23  | 2030-31 |

### 3.3 Transmission schemes to be added under inter-state during 2030-35

#### a) Sub-stations:

| Sl. No.      | Name of sub-station | Voltage (kV) | Transformation Capacity (MVA) | Anticipated Date of Commissioning |
|--------------|---------------------|--------------|-------------------------------|-----------------------------------|
| 1.           | Balaramapuram       | 400          | 2x500                         | 2034-35                           |
| <b>Total</b> |                     |              | <b>1000</b>                   |                                   |

#### b) Transmission Lines:

| Sl. No. | Transmission Line                             | Voltage (kV) | No. of circuits | Ckm | Anticipated Date of Commissioning |
|---------|-----------------------------------------------|--------------|-----------------|-----|-----------------------------------|
| 1       | 400 kV line from Koodamkulam to Balaramapuram | 400          | D/c             | 200 | 2034-35                           |

|   |                                                         |     |     |    |         |
|---|---------------------------------------------------------|-----|-----|----|---------|
| 2 | Pallippuram<br>(Trivandrum-400 kV)<br>to Balaramapuram. | 400 | D/c | 80 | 2034-35 |
|---|---------------------------------------------------------|-----|-----|----|---------|

Adequate reactive compensation has been planned in intra state network. While planning of intra-state network, 1,188 MVAR including the new proposal of 395 MVAR, at 66 kV and above buses have been considered at low voltage intra-state Sub-stations, as per requirement.

## Chapter-4

### Transmission Plan for Renewable Energy Generation Plants in Kerala

#### 4.1 Introduction:

The Transmission Plan for Renewable Energy Generation Plants in Kerala outlines the strategy for developing and strengthening the state's transmission network to efficiently evacuate power from renewable sources such as solar, wind and small hydro. It integrates both Green Energy Corridor (GEC) projects and individual project-level evacuation systems to ensure reliable connectivity, grid stability and compliance with regulatory standards. The plan focuses on establishing new 110 kV and 220 kV substations, upgrading existing lines and reinforcing corridors in renewable-rich districts like Kasaragod, Palakkad, and Idukki. Its objective is to create a robust and future-ready transmission infrastructure that supports Kerala's renewable energy expansion and contributes to India's clean energy goals.

#### 4.2 Status of Intra-State transmissions schemes planned under Green Energy Corridor (GEC) scheme:

**Table 4.1:** Intra-state transmission system planned under GEC

| Scheme  | RE<br>(MW) | ckm   | MVA   | Status               |
|---------|------------|-------|-------|----------------------|
| GEC-II  | 452        | 224   | 620   | Under implementation |
| GEC-III | 1,759      | 1,422 | 1,973 | Planned              |

#### 4.3 Transmission plan for RE Capacity to be integrated to Intra-state transmission system in Kerala

##### 4.3.1. Green Energy Corridor Phase-II (GEC-II) scheme:

Following transmission system for evacuation of renewable energy was approved under GEC-II scheme:

##### Attapady Green Corridor Project (AGC)

1. 2x100 MVA, 220/110 kV S/s at Mannarkad (GIS)
2. 2x100 MVA, 220/33 kV S/s at Agali (GIS)
3. 220 kV D/C line from Vettathur tap to Mannarkad- 28 km
4. 220 kV D/C line from Mannarkkad to Agali- 30 km

### **Ramakkalmedu Green Corridor Project (RGC)**

1. 2x60 MVA, 110/33 kV GIS S/s at Pushpakandam (near Anakkaramedu)
2. Upgradation of Vazhathope substation - Construction of 2 nos 110 kV feeder bays
3. 2 nos. of 110 kV bays at Nedumkandam
4. 100 MVA, 220/110 kV substation at Nirmala City (near Kattapana) with 2 Nos of 220 kV feeder bays and 6 Nos of 110 kV feeders
5. 110 kV D/C line from Anakkaramedu to Nedumkandam substation- 9 km
6. 20 km, 220/110 kV MCMV line from Kuyilimala to Nirmala City and 5 km 110 kV D/C line from Nirmala City to Kattappana along ROW of existing 66 kV S/C line

#### **4.3.2 Green Energy Corridor Phase-III (GEC-III) scheme:**

Major transmission system for evacuation of renewable energy has been planned under Green Energy Corridor Phase-III (GEC-III) scheme. KSEBL submitted proposals under GEC-III scheme to strengthen the state's transmission infrastructure for efficient renewable energy evacuation. Accordingly, a joint study meeting was convened with the CEA, SRPC, CTUIL, SRLDC and KSEBL to review and finalize the proposed schemes. The proposals encompass both the transmission plan for renewable energy (RE) capacity integration with the Inter-State Transmission System (ISTS) and the development of intra-state transmission systems within Kerala to ensure reliable and seamless power evacuation. The detail of the schemes planned under GEC-III is attached as **Annexure**.

## Recommendations

- Summary of transmission systems planned under ISTS and InSTS to be commissioned by 2029-30 is given below:

|                                                | 400 kV | 220 kV | Total |
|------------------------------------------------|--------|--------|-------|
| <b>Inter-State Transmission System (ISTS)</b>  |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 2500   | 0      | 2500  |
| <b>Transmission Line (ckm)</b>                 | 474    | 0      | 474   |
| <b>Intra-State Transmission System (InSTS)</b> |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 3000   | 5500   | 8500  |
| <b>Transmission line (ckm)</b>                 | 20     | 472    | 492   |

- Summary of tentative transmission system planned under ISTS and InSTS to be commissioned between 2030-31 and 2034-35 is given below:

|                                                | 400 kV | 220 kV | Total |
|------------------------------------------------|--------|--------|-------|
| <b>Inter-State Transmission System (ISTS)</b>  |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 1000   | 0      | 1000  |
| <b>Transmission Line (ckm)</b>                 | 280    | 0      | 280   |
| <b>Intra-State Transmission System (InSTS)</b> |        |        |       |
| <b>Transformation Capacity (MVA)</b>           | 0      | 2560   | 2560  |
| <b>Transmission line (ckm)</b>                 | 0      | 1169   | 1169  |

- All the planned transmission network should be timely implemented especially where the transmission constraints being faced. Tendering and award of the transmission elements should also be expedited.
- Adequate space provision in the new substations should be kept for extension/augmentation to integrate additional RE and to meet future load growth. Also, KSEBL should provide appropriate

space provisions for 110 kV and 33 kV bays in their upcoming grid substations for supply of power to DISCOMs.

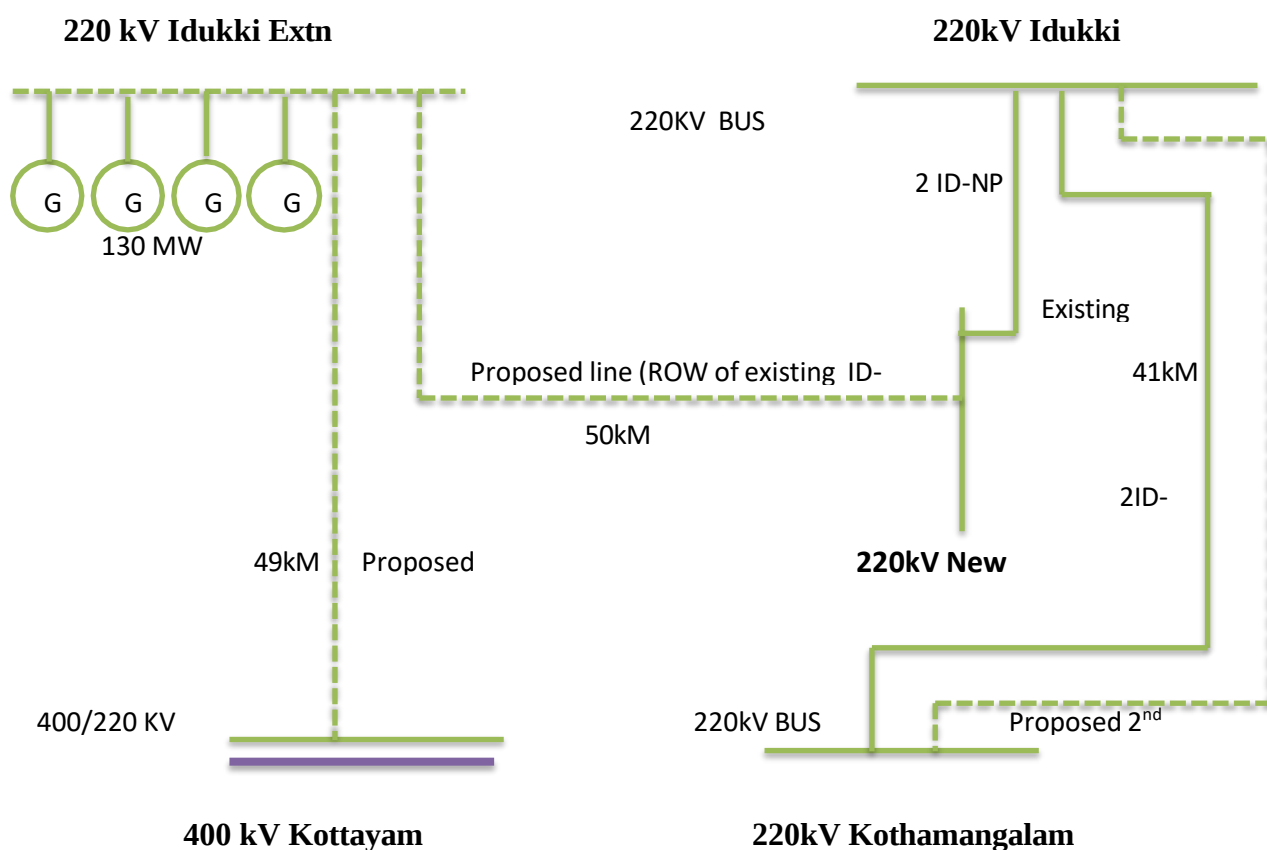
5. Transmission schemes which are planned/under planning for implementation till 2029-30 and 2034-35, may be taken up earlier or later as per requirement of Discom, actual load growth, integration of RE etc. Accordingly, the Resource Adequacy Plan for transmission system in the State may be reviewed in the coming years.

### **Transmission Proposals under GEC-III Scheme for Kerala:**

### A. Power evacuation of Idukki Extension scheme (130 MW\*4)

1. Constructing 50 kM 220 kV Idukki Extension to New Pallom DC Feeders
2. Constructing 49 kM 220 kV Idukki Extension to Kottayam DC Feeders.
3. Upgradation of 41 kM 220 kV Idukki-Kothamangalam feeder to Double Circuit (for satisfying the N-1 criteria for the 780 MW Idukki generation).

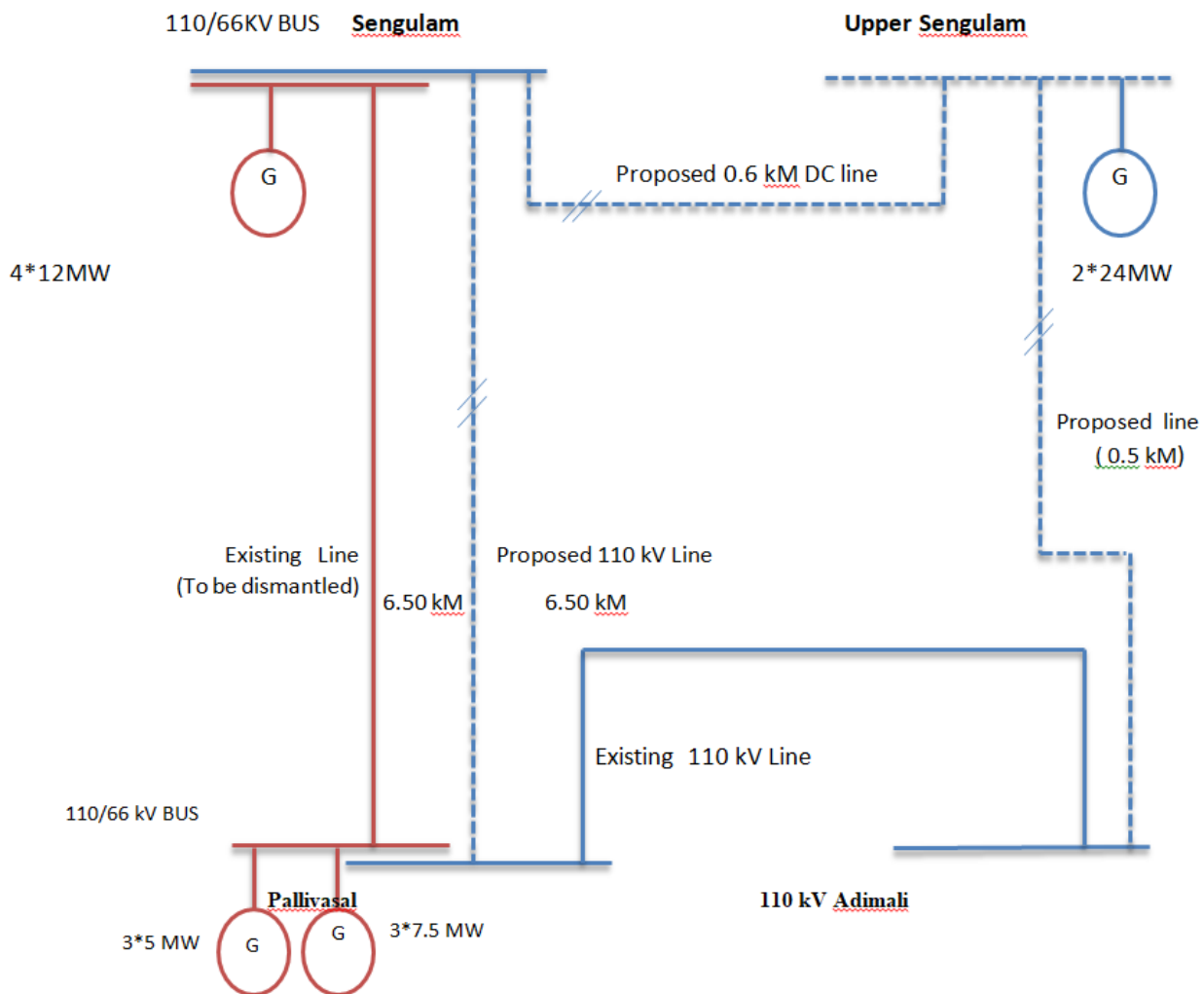
**SLD of the proposed Scheme is given below:**



## B. Power evacuation of Upper Sengulam HEP -Upgradation of Pallivasal -Sengulam line

1. Dismantling of existing 66 kV Pallivasal - Sengulam line and Constructing 6.5 km new 110 kV Pallivasal - Sengulam DC line in the same RoW.
2. Construction of 0.5 km new Upper Sengulam- Adimali 110 kV DC line.
3. Construction of 0.6 km new 110 kV DC line from Upper Sengulam –Sengulam

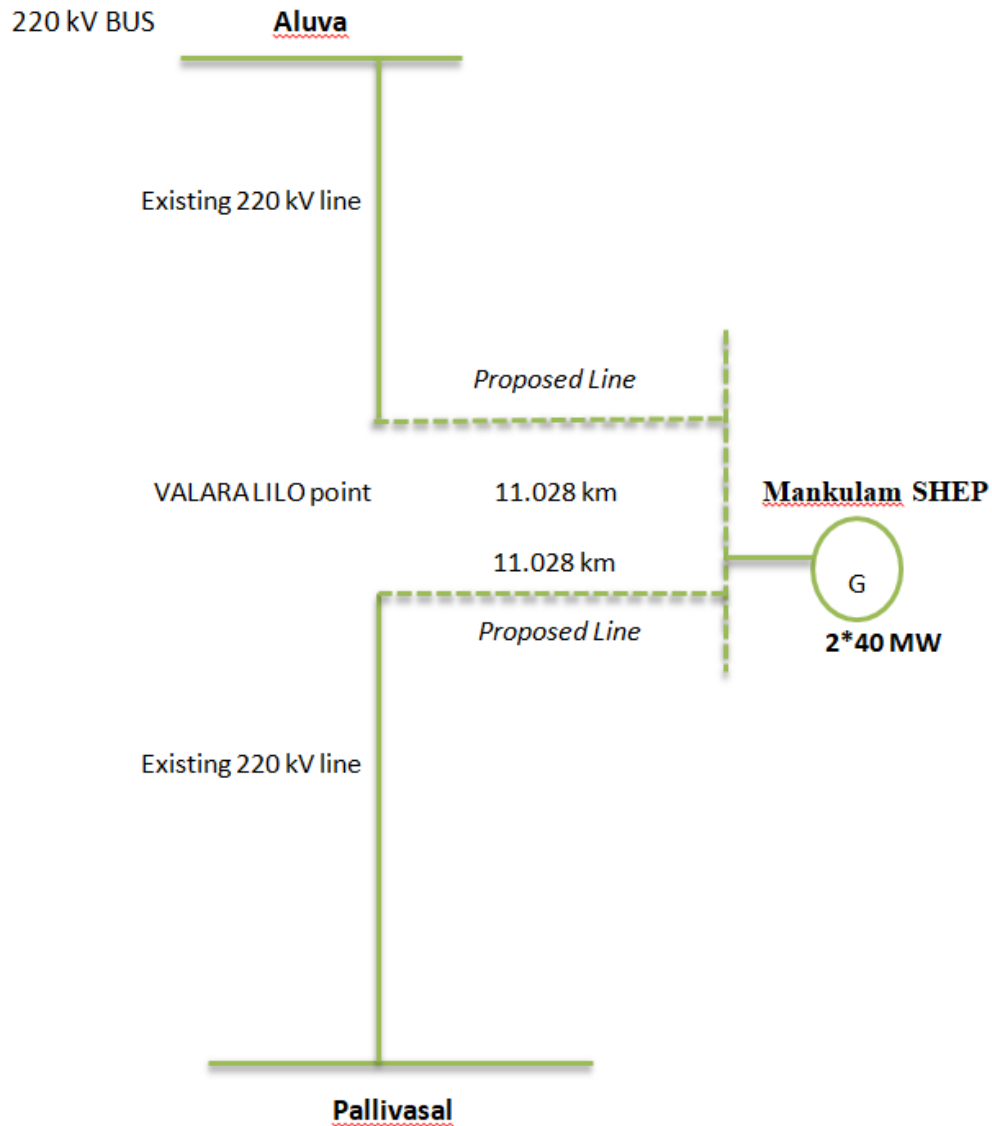
SLD of the proposed Scheme is given below:



### C. Power evacuation of Mankulam HEP (2\*40 MW)

1. Construction of 11.028 km 220 kV DC LINE from Mankulam- Valara LILO portion.

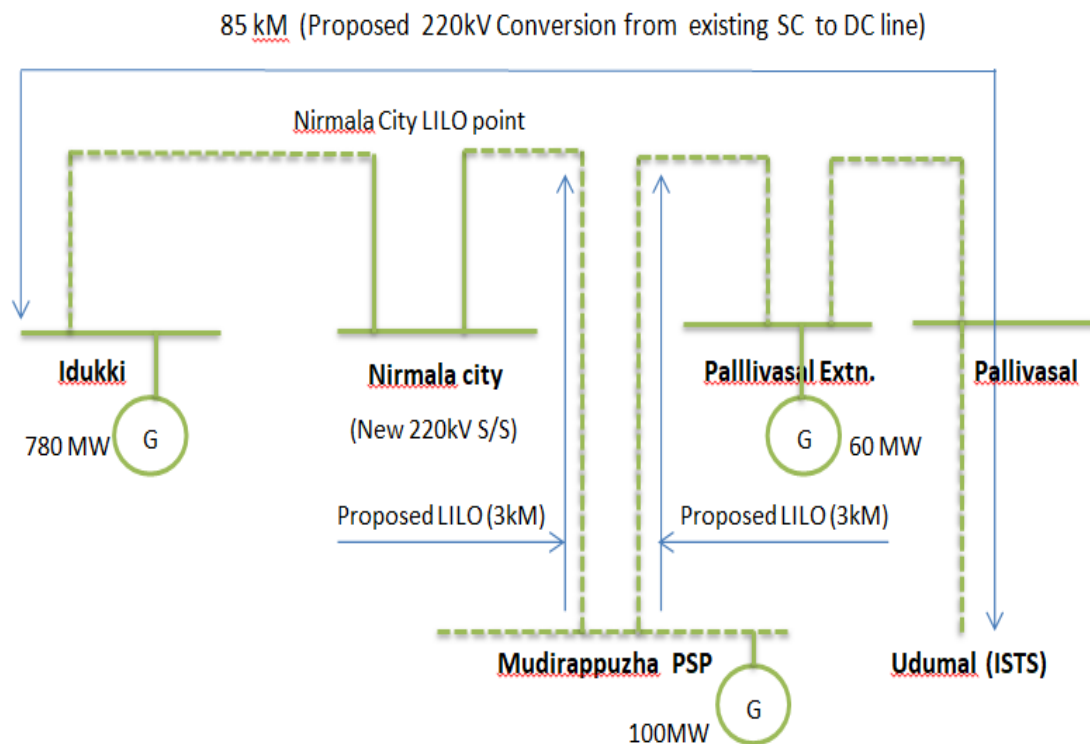
SLD of the proposed Scheme is given below:



#### **D. Power evacuation Mudirappuzha PSP (100 MW) and Pallivasal Extn. (60 MW)**

1. Conversion of 40 kM existing 220 kV SC line to DC :- Idukki - Nirmala city LILO point – Pallivasal Extension – Pallivasal having line length of 40 kM using double PANTHER (220 kV Nirmala city is ongoing substation and LILO portion to this substation is already constructed).
2. Construction 3 kM of 220 kV Multi circuit line (2xD/C) as LILO arrangement from Pallivasal extension to Nirmala city 220 kV line using ACSR PANTHER to connect Mudirappuzha PSP.
3. Conversion of 45 kM 220 kV Pallivasal - Udumal SC lines to DC (Kerala portion) having line length of 45 kM using double PANTHER

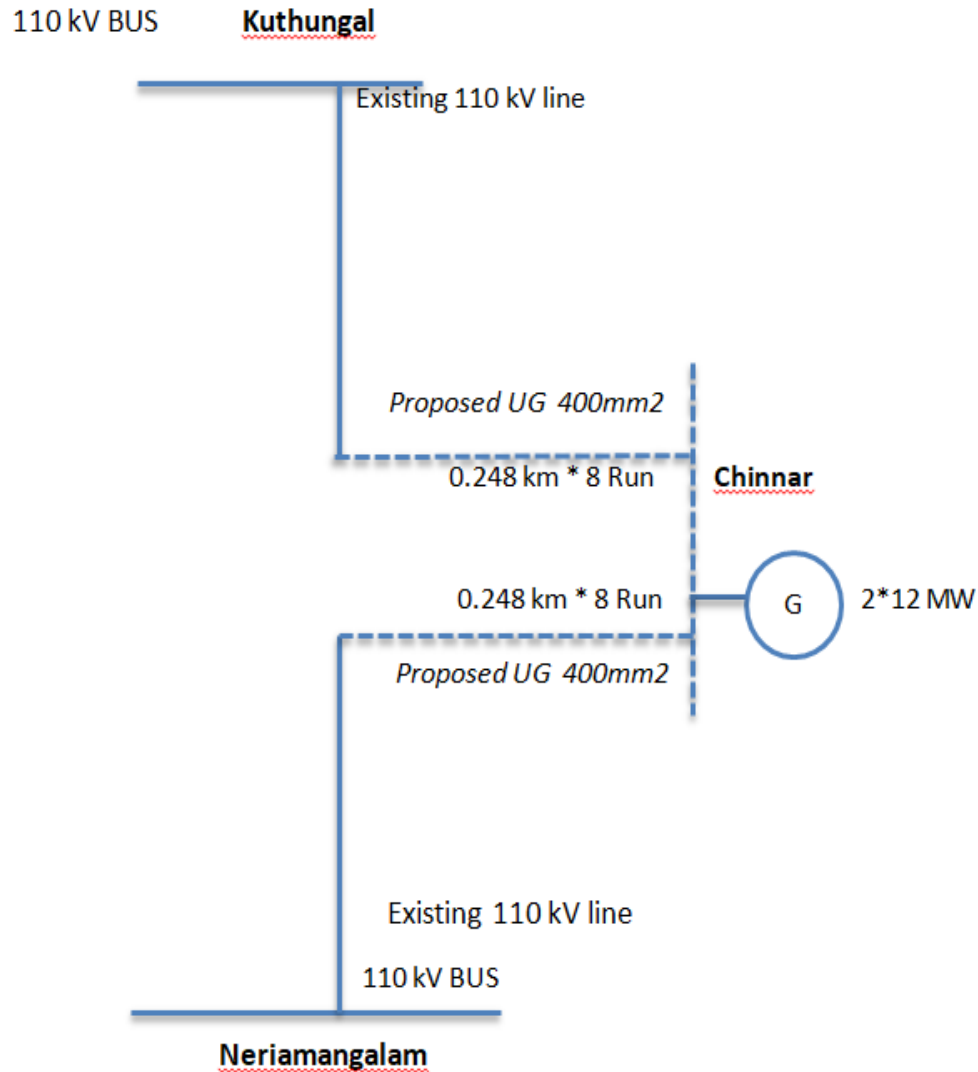
SLD of the proposed Scheme is given below:



### E. Power evacuation of Chinnar HEP (2\*12 MW)

- Construction of 1.92 km 11 kV LILO by Laying of 8 runs of Single core 110 kV 400 Sqmm UG Cable from Kuthungal- Neriamangalam LILO portion.

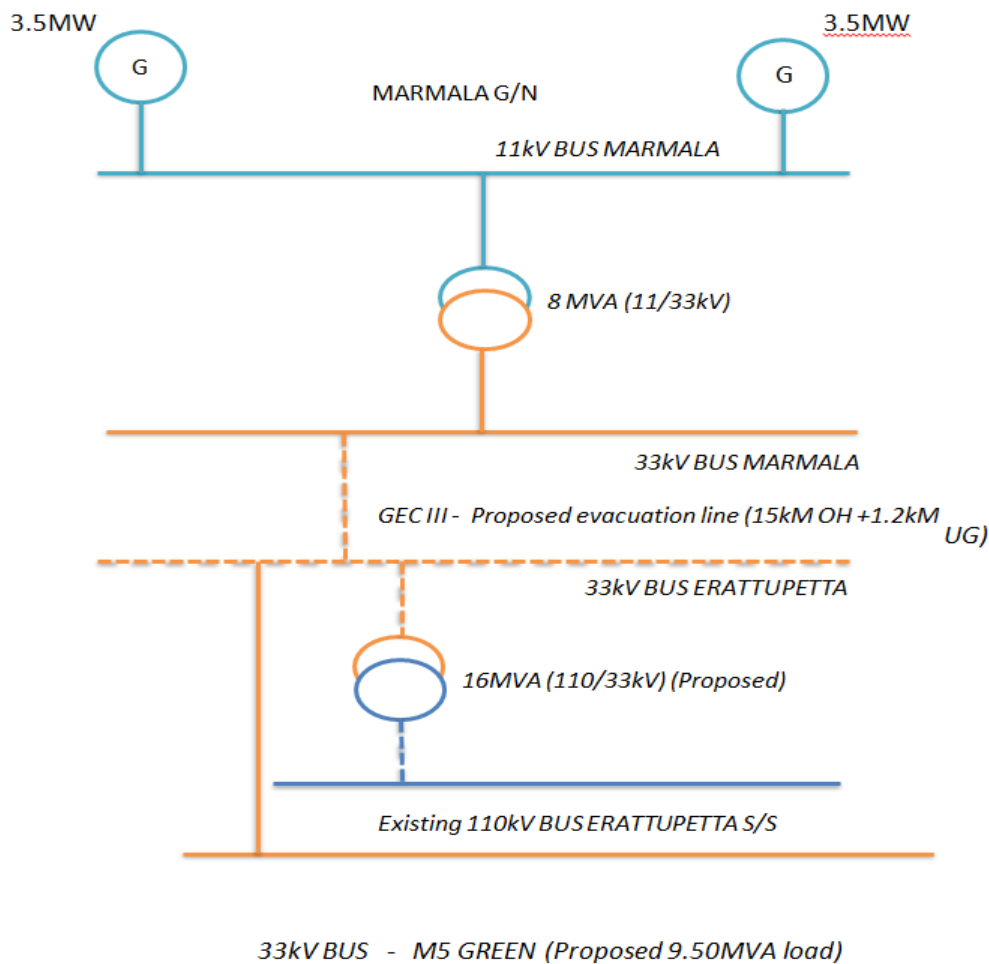
SLD of the proposed Scheme is given below:



## F. Evacuation of Marmala SHEP (2x3.5 MW)

1. Construction of 16.2 kM Single Circuit Line using 15 kM Covered Conductor and 1.2 kM UG Cable (0.6 kM at both ends) for 33 kV power evacuation line from proposed Marmala SHEP (2x3.5 MW) to 110 kV SS, Erattupetta.
2. Line using covered conductor for 15 kM is drawing through the ROW of existing 11 kV Teekoy Feeder from Erattupetta SS. This route is selected to avoid the complexity of drawing over headline through the congested Erattupetta Town.
3. 0.6 kM 33 kV UG Cable is used in the Starting and Ending portion of the feeder.
4. Construction of Transformer Bay at 110 kV Sub-Station Erattupetta using 1\*16 MVA 110/33 kV Transformer and 33 kV 3 Panel Indoor VCB Set and Two outlets.

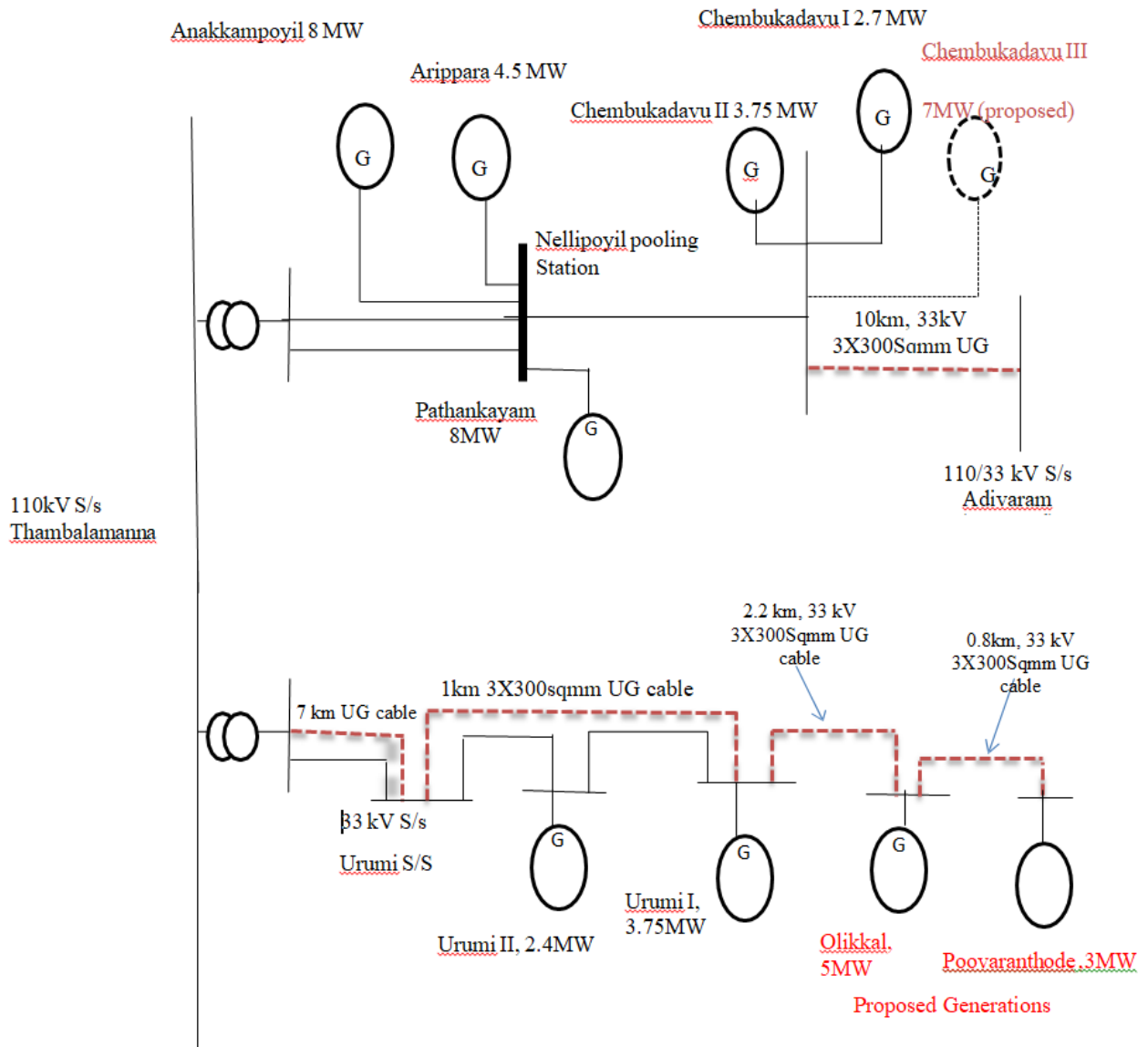
SLD of the proposed Scheme is given below:



**G. Strengthening of power evacuation network of Hydel Electric Projects under Iruvanjipuzha and Pozhilingapuzha river basin**

1. Construction of alternate 33 kV feeder (UG Cable, 7 kM) from 33 kV Urumi to 110 kV Thambalamanna and one 33 kV feeder bay at 110 kV Thambalamanna.
2. Construction of 1.0 km 33 kV UG cable from Urumi I to 33 kV Urumi Substation.
3. Construction of 2.2 km 33 kV UG cable from proposed Olikkal to Urumi I and 0.8 km 33 kV UG cable from Poovaramthode to Olikkal and construction of 2 nos of 33 kV feeder bay at Olikkal.
4. Interlinking Chembukadavu SHEP to new 110 kV Adivaram Substation by installing 110/33 kV 16 MVA Transformer at Adivaram substation and laying 10 km 33 kV UG cable.
5. Urumi I & II & Chembukadavu I & II are old projects which started power generation during 2003- 2004 period. The power evacuation network from these projects are very old overhead lines with limited capacity and the terrain are such that, these power evacuation networks are frequently subjected to external disturbances and severely affects power generation from these hydel projects. Also, Olikkal, Poovaranthode & Chembukadavu-III hydel projects are proposed along the same river basin. This proposal envisages for establishing new reliable power evacuation network using UG cables and enhancing receiving substation capacity in order to tap maximum hydel potential from the existing and upcoming small hydel projects.

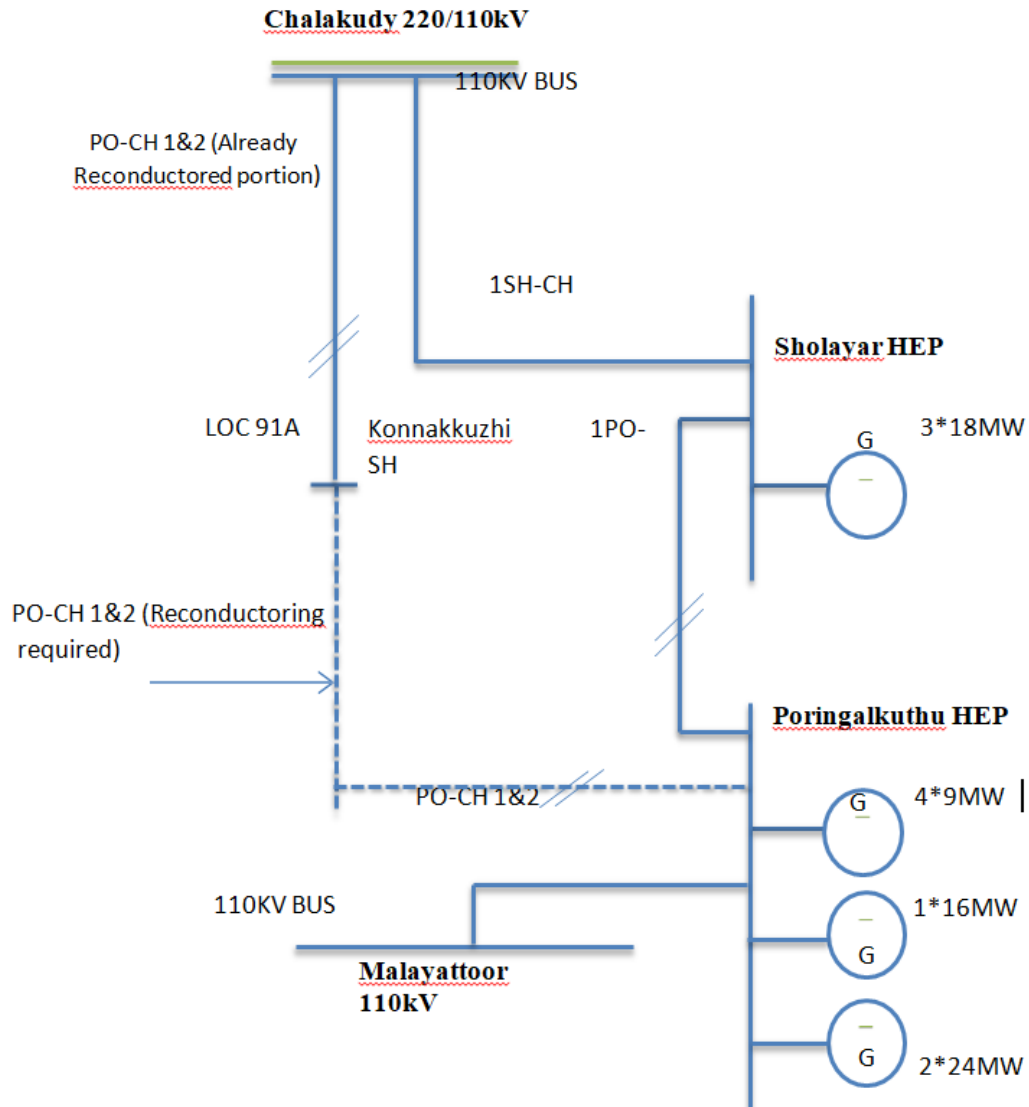
**SLD of the proposed Scheme is given below:**



## **H. Re-conductoring of 1 POCH 1 & 2 Feeders from Poringalkuthu Power House to Konnakuzhi (Loc 1 to 91A) in Thrissur district.**

1. Re conductoring 22 km of 1POCH 1&2 feeder portion to HTLS type ACSS Tiger conductor from Poringalkuthu generating station to Konnakuzhi 220kV tap portion (Loc No. 1 to 91A).
2. The reconductoring is proposed for reliable evacuation of power from Poringalkuthu and Sholayar HEP.

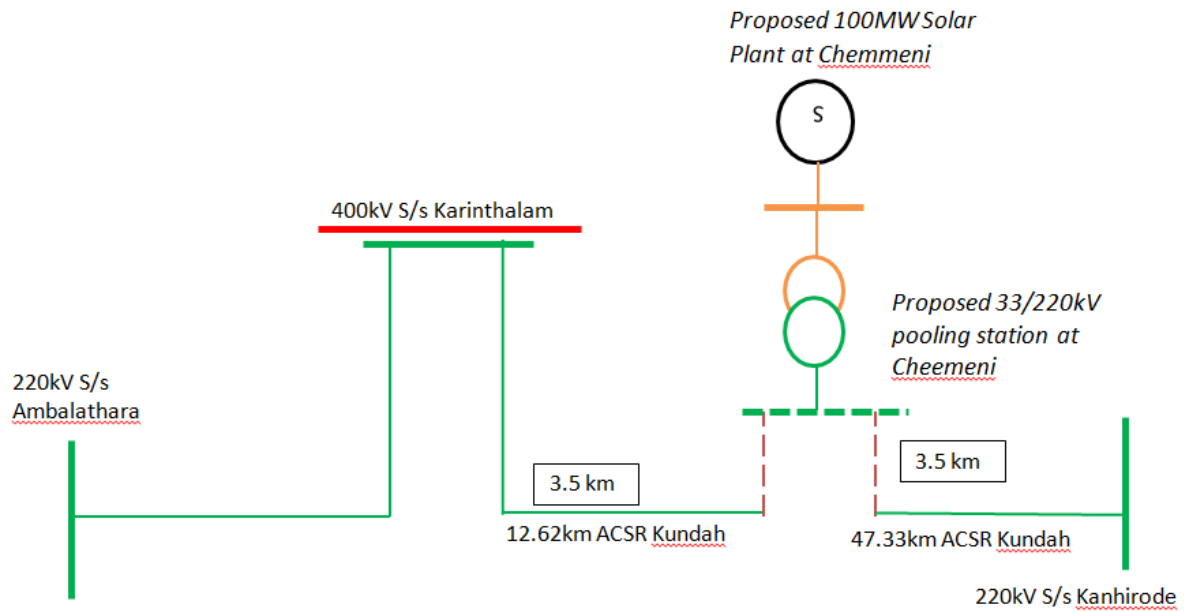
SLD of the proposed Scheme is given below:



## I. LILO of 220 kV Karinthalam- Kanhirode D/C line at Cheemeni

1. LILO of 220 kV Karinthalam - Kanhirode D/C line at Cheemeni, Kasargode project to evacuate the 100 MW Solar Plant at Chemmeni.

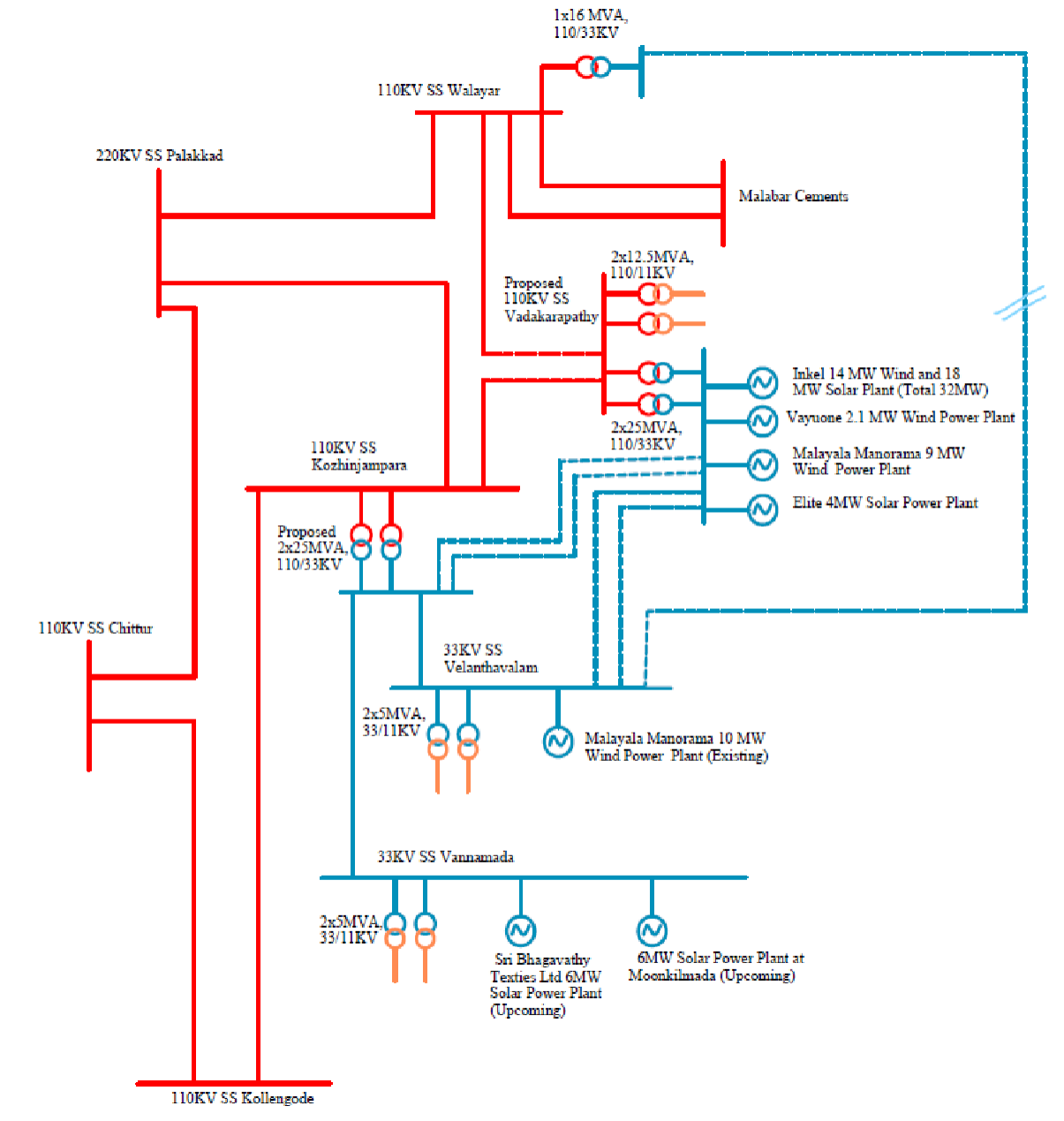
SLD of the proposed Scheme is given below:



**J. Infrastructure Project for the Renewable Energy Evacuation from the Proposed 110 kV Substation Vadakarappathy, 110 kV Substation Walayar, 110 kV Substation Kozhinjampara and 33 kV Substation Velanthavalam**

1. Construction of LILO of one circuit of Kozhinjampara – Walayar line at proposed 110 kV Vadakarappathy (LILO length 8 km).
2. Construction of 110 kV Substation at Vadakarappathy with installation of 2 Nos. of 110/33 kV 25 MVA Transformers and 2 Nos. of 110/11 kV 12.5 MVA Transformers.
3. Construction of 33 kV Vadakarappathy-Kozhinjampara DC line.
4. Capacity enhancement at 110 kV Substation, Kozhinjampara by replacing 2 Nos. of 110/33 kV 16 MVA Transformers to 2 Nos. of 110/33 kV 25 MVA Transformers.
5. Construction of 33 kV Vadakarappathy-Velanthavalam DC line.
6. Installation of one 110/33 kV 16 MVA Transformer at 110 kV Walayar and construction of 33 kV Velanthavalam-Walayar DC line (line length 10 km)

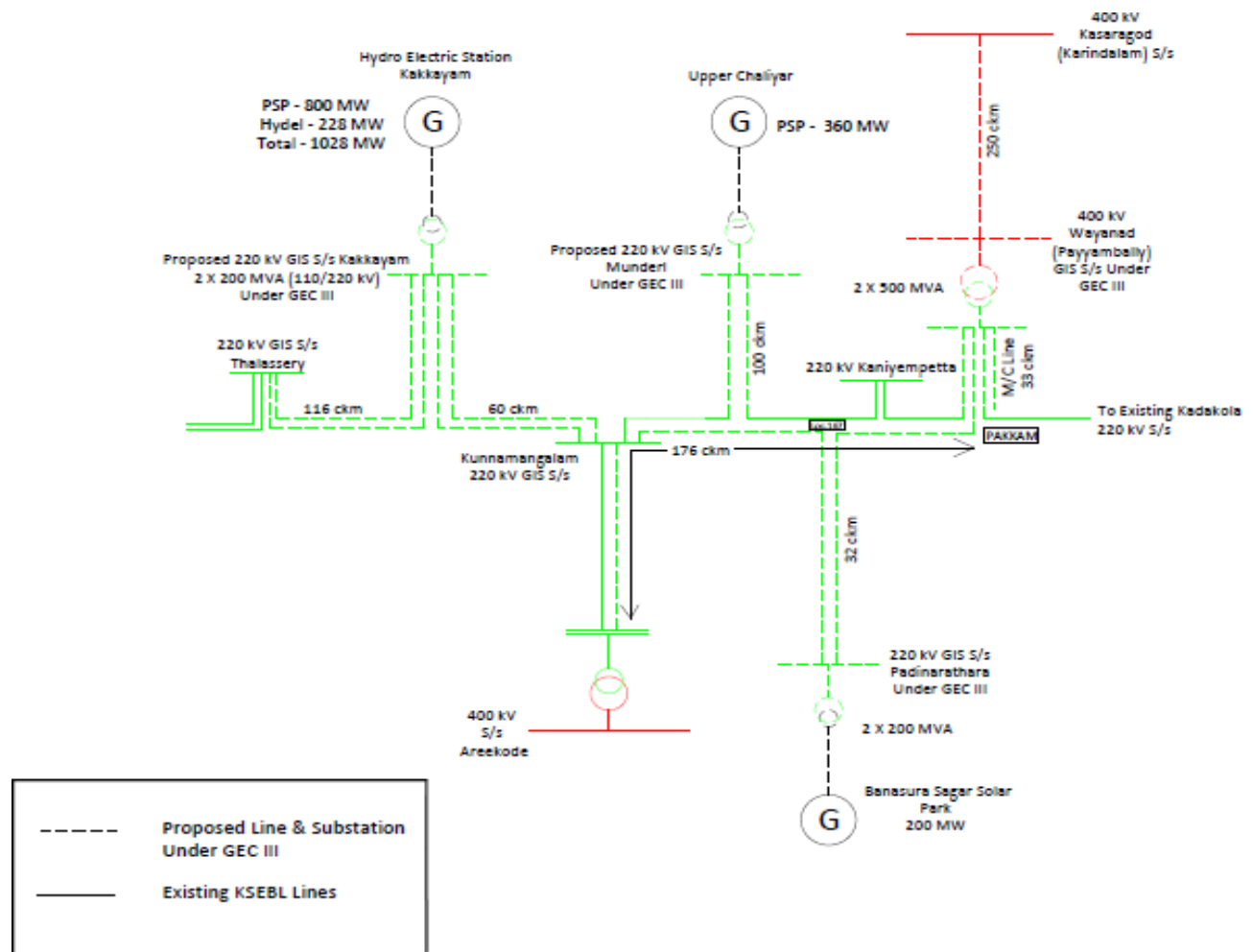
**SLD of the proposal is given below:**



**K. Power Evacuation System for Kakkayam (PSP and Hydel-1028 MW), Upper Cheliyar PSP (360 MW) & Banasura Sagar Solar Park (200 MW) and system strengthening**

- Construction of 400 kV Substation at Wayand by installing 400/220 kV, 2x500 MVA Transformers and 400 kV Kasaragod-Wayanad DC line.
- Construction of 220 kV multi circuit line from 400 KV Substation at Wayand to Pakkam (LILO point of Kaniyampetta to Kadakola 220 kV Line).
- Construction of 220 kV double circuit line from Pakkam LILO point to Areacode 220 kV substation by converting existing 220 kV single circuit line.
- Construction of 220 kV Multi Circuit line from Thalassery to Kakkayam to Kunnamangalam and construction of 220 kV GIS substation at Kakkayam.
- Construction of LILO of one circuit of 220 kV Kunnamangalam-Kaniyampetta line to proposed Munderi 220 kV GIS substation and construction of 220 kV GIS substation at Munderi for evacuation of Upper Cheliyar (PSP 360 MW).
- Construction of LILO of one circuit of 220 kV Kunnamangalam-Wayanad line to proposed Padinjarethara 220 kV GIS substation and construction of 220 kV GIS substation at Padinjarethara (for evacuation of 200 MW Banasura Sagar Solar Park).

SLD of the proposal is as given below:



#### L. Power evacuation of Pazhassi Sagar SHEP (3x2.5 MW)

- Construction of 0.3 KM 33 KV DC line with DOG conductor using TTB towers and stringing 0.6 Km meter 33 KV covered conductor using lattice poles for power evacuation from Pazhassi Sagar SHEP connecting to 33kV DC line from 110 kV substation Mattannur to 33 kV substation Kuyiloor

SLD of the proposed Scheme is given below:

