NEPAL ELECTRICITY AUTHORITY

TRANSMISSION/PROJECT MANAGEMENT DIRECTORATE

A Year Book-Fiscal Year 2018/2019 (2075/2076 BS)

August 2019 (Bhadra 2076)
Durbar Marg, Kathmandu, Nepal


WELCOME
नेपाल विद्युत प्राधिकरण
स्याउले १३२/३३/११ के.भी. सवस्टेशन

Table of Contents

MESSAGE FROM THE MANAGING DIRECTOR

It is a moment of great pleasure to know that the Transmission Directorate/Project Management Directorate is bringing out the annual publication highlighting various aspects of its activities on the auspicious occasion of Nepal Electricity Authority (NEA)'s 34th anniversary. The role of this directorate is very vital and crucial in terms of the transmission links between generations and distributions as well as load management of the whole power system of Nepal. It has successfully completed the various projects as well as the effectively and efficiently managed the power system in the fiscal year 2018/19 (2075/76 BS). The scheduling of the available power to meet the system demand was a real challenge, which the Transmission Directorate managed successfully. I am glad to note that this directorate is putting its best effort to provide the quality and reliable power through the optimal scheduling of supply and demand as well as strengthening the transmission networks by completing the various initiated projects based on latest state-of-the-art control, protection and automation system.

Besides the various challenges in construction of transmission system such as right of way (ROW), land acquisition, social safe guards, forest clearances, these directorates have successfully completed the construction and bring into operation of 606 circuit km transmission lines and added 738 MVA capacity in grid substations in this fiscal year.

I would like to congratulate the entire team for their best efforts to bring out the Publication. This is a good tool of communication to various stakeholders to inform about the endeavors being taken up and opportunities and challenges being faced by NEA, in general and Transmission Directorate, in particular, to serve the valued customers with quality and reliable power supply.

.....

(Kul Man Ghising)
Managing Director

MESSAGE FROM THE DEPUTY MANAGING DIRECTOR, TRANSMISSION DIRECTORATE

Transmission system construction and system operation are the two most important activities in effective and efficient operation of any power system. NEA management has decided to bring out the current publication which covers brief description of various projects being implemented through this Directorate, information on system components, upgradation and rehabilitation works and the effort the Directorate is putting to improve the reliability of transmission system, in addition to regular activities related to operation and maintenance undertaken during the year under review.

The fiscal year 2018/19 (2075/76 BS) was quite successful for Transmission Directorate. Transmission loss has been reduced to all time low value of 4.35%. Five transmission line projects namely Middle Marsyangdi-Dumre-Damauli 132 kV Transmission Line, Kusum-Hapure 132 kV transmission line, Lamahi- Ghorahi 132 kV Transmission Line, Kohalpur-Mahendranagar 132 kV 2nd circuit transmission line, Kabeli 132 kV transmission corridor (Second and Third Section) and two substation projects namely Dhalkebar 220/132 kV and Rupani 132/33kV substations were completed and put into operation. Furthermore, the 220 kV system was successfully introduced in the Integrated Nepal Power System (INPS) by commissioning of 220/132 kV, 2x160 MVA transformer substation at Dhalkebar.

The Directorate has come up with the planned and systematic effort to augment transmission system capacity by constructing new transmission lines and substations of 132 kV, 220 kV and 400 kV voltage levels, adding new circuits in the existing towers and upgrading the substation capacities wherever essential to overcome the bottle necks and meet the increasing power demand. The total transmission line length completed and brought into operation in this FY is 606 circuit km. Similarly, a total of 738 MVA substation capacity has been successfully upgraded and added to the system. Further, capacitor banks at three locations with total capacity of 42.5 MVAr have been installed to improve voltage profile.

Forty projects are at different stage of construction and Thirty projects are planned for execution in the coming FY. The total line length of transmission lines under construction are 949 circuit km, 1318 circuit km and 756 circuit km at 132 kV, 220 kV and 400 kV respectively. Similarly, the capacity of substation under construction at 132 kV, 220 kV and 400 kV voltage levels are cumulatively 9500 MVA.

In this FY, Emergency Restoration Towers (ERS) have been used at three different locations where either long shut down of existing charged transmission line was not desired or complete failure of tower occurred and we are glad to inform that ERS has helped us keep the power interruption minimum to the possible extent.

As a system operator, rationing of the limited generation among various users was indeed a difficult task which was well managed by prudent system operation and import of energy from India. To make the system operation more effective and efficient, present Load Dispatch Centre (LDC) upgradation is under progress and two regional LDCs at Butwal and Dhalkebar are planned.

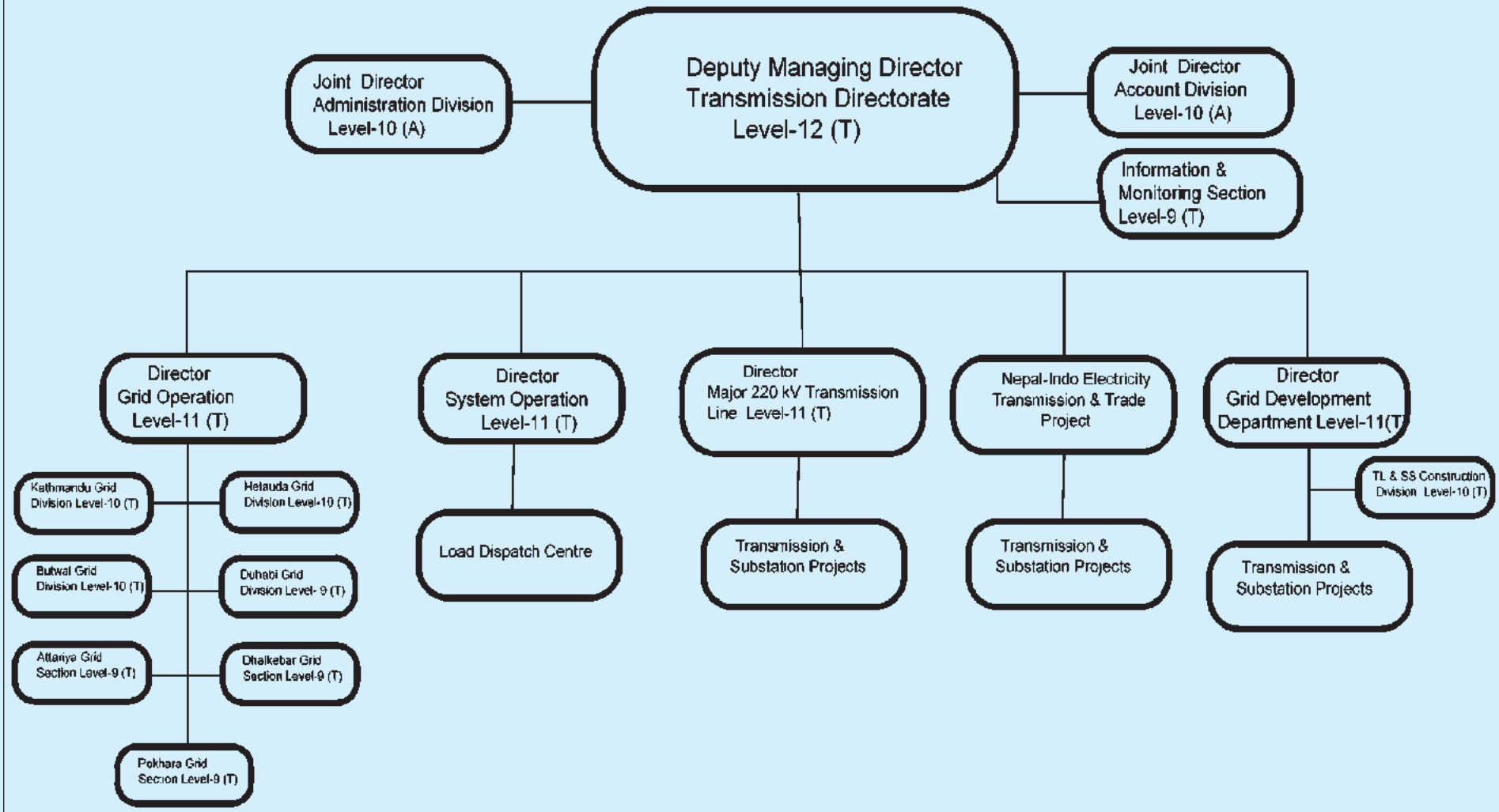
I sincerely believe that this publication will inform NEA stakeholders about the efforts undertaken by Transmission Directorate to address the present situation of supply-demand mismatch within the country, to augment transmission infrastructure in the country and provide comprehensive information about the INPS and ongoing projects.

I would like to appreciate the effort put in by my colleagues within the Directorate to bring out this publication. We shall update this publication on annual basis. Any suggestion on the improvement of this Publication is always welcome.

.....

(Braj Bhushan Chaudhary)
Deputy Managing Director

CORPORATE STRUCTURE OF TRANSMISION DIRECTORATE



DEPARTMENT/ DIVISION CHIEFS

Mr. Dirghayu Kumar Shrestha
Director
Grid Operation

Mr. Durga Nanda Bariyait
Director
Grid Development

Mr. Suresh Bahadur Bhattarai
Chief
System Operation

Mr. Bishwo Nath Sharma
Division Chief Administration

Mr. Ramesh Kumar Karki
Division Chief Finance

Abbreviations

ACSR	Aluminum Conductor Steel Reinforced
SC	Single Circuit
DC	Double Circuit
TL	Transmission Line
SS	Substation
P/S	Power Station
HPP	Hydro Power Project
INPS	Integrated Nepal Power System
IPP	Independent Power Producer
NEA	Nepal Electricity Authority
NRs.	Nepalese Rupee
GoN	Government of Nepal
ADB	Asian Development Bank
WB	World Bank
EoI	Exim Bank of India
KfW	German Development Bank
EIB	European Investment Bank
JICA	Japan International Cooperation Agency

Electrical Terminology

V	(Volt)	-Unit of voltage
kV	(kilovolt)	-1,000 volts
W	(Watt)	-Unit of active power
kW	(kilowatt)	-1,000 watts
MW	(Megawatt)	-1,000 kW
Wh	(watt-hour)	-Unit of Energy
kWh	(kilowatt-hour)	-1,000 Wh
MWh	(Megawatt-hour)	-1,000 kWh
GWh	(Gigawatt-hour)	-1,000 MWh
TWh	(Terawatt-hour)	-1,000 GWh
VA	(Volt-ampere)	-Unit of apparent power
kVA	(kilovolt-ampere)	-1,000 VA
MVA	(Megavolt-ampere)	-1,000 kVA
VAr	(volt-ampere reactive)	-Unit of reactive power

TRANSMISSION DIRECTORATE

Transmission Directorate is one of the nine directorates in the overall organization structure of NEA. This, like the other directorates, is headed by a Deputy Managing Director. The present incumbent is Mr. Braj Bhushan Chaudhary. Under this directorate there are four departments, namely; Grid Operation Department (GOD), System Operation Department (SOD), Grid Development Department (GDD) and Major 220 kV Transmission Line Department each of which is headed by a Director. Further, the major 400 kV Transmission Line Projects are also under this directorate.

The directorate develops, implements, constructs, operates, maintains, and monitors high-voltage transmission lines and substations from 66 kV to 400 kV voltage level that are necessary for transmission of power generated from the various NEA and IPP owned power plants to the distribution system networks and undertakes reinforcement/ upgradations of existing transmission lines and substations.

The directorate conducts short term, medium term and long term plan for the development of transmission system network of 66 kV and above voltage levels to transmit the power generated as per GoN plan (15,000 MW in 10 years) as well as meet the rapid growing demand of the country.

Till now, INPS system has been charged up to 220 kV voltage level and planned to upgrade at 400 kV in current fiscal year. All the new under construction substations will be equipped with a state-of-the-art control, protection and automation system based on IEC 61850 open standards to facilitate communication between numerous devices within the substation and beyond the substation. Moreover, this directorate has additional responsibility to operate INPS in synchronous mode with Indian Grid in order to make system reliable, secured and robust.

Further, this directorate is responsible for power exchange across the cross-border countries. The first ever 400 kV Dhalkebar-Muzzaffapur cross-border transmission line has been charged successfully at 220 kV voltage level in previous fiscal year. In addition, financial modalities for the construction of Butwal-Gorakhpur 400 kV cross-border transmission line is in the final stage and the preparation of detail design of Inaruwa-Purniya and New Lumki (Dododhara)- Bareli cross border transmission lines are in progress.

RECENTLY COMPLETED PROJECTS

1. Middle Marsyangdi-Dumre-Damauli 132 kV Transmission Line

Objective of this project was to increase the reliability insuring N-1 contingency of transmission line of the region, evacuate power from hydro power projects and decrease transmission line loss.

The scope of project was to string 39 km 132 kV second circuit Middle Marsyangdi-Marsyangdi transmission line on existing double circuit tower, construct 21 km of new lines for 132 kV loop in loop out scheme from taping point at Dumre (Chyangli) to existing Damauli substation, 132/33 kV, 30 MVA substation at new Markichwok and necessary 132 kV line bays at Switchyard of Marsyangdi Power Plant. The project cost was US$ 18.62 Million which is jointly funded by loan assistance of ADB, GoN and NEA.

Construction of 39 km of second circuit from Middle Marsyangdi to Marsyangdi has been completed and charged on Chaitra 2074 (March 2018); Construction of 21 km of loop in loop out transmission line to Damauli and 132/33 kV, 30 MVA substation at Markichowk, Tanahu have been completed and charged on 21st Chaitra 2075 (4th April 2019).

2. Dhalkebar 220/132 kV Substation

Nepal-India Electricity Transmission and Trade Project (NIETTP), funded by World Bank was started with the objective of establishing cross-border transmission capacity of about 1,000 MW to facilitate electricity trade between India and Nepal; and to meet the increasing demand of electricity in Nepal by the sustainable import of electricity. The project includes design, supply and construction of approximately 288 km of 400 kV double-circuit Quad Moose transmission line through Hetauda-Dhalkebar-Inaruwa that covers 10 different districts along with the concomitant 220 kV substations at Hetauda, Dhalkebar and Inaruwa.

Dhalkebar substation is the pulling station for the Dhalkebar Muzzaffarpur 400 kV Cross-Border Line between Nepal and India and it is a major hub for the exchange of power in the Integrated Nepal Power System. 220/132 kV, 2X160 MVA Power Transformer at Dhalkebar substation has been successfully tested and charged on 32nd Ashadh 2075 (16th July 2018). Similarly, Dhalkebar-Muzzaffarpur 400 kV line was charged at 220 kV on 31st Shrawan 2075 (16th August 2018) and started importing power from India.

3. Kusum - Hapure 132 kV Transmission Line

Objective of this project was to develop transmission system up to Dang Cement to be established at Hapure of Dang. Further Sonapur and Rolpa cements shall be benefited by the further extension of this line. The project cost was about US$ 5 Million and financed by GoN through Ministry of Industry, Commerce and Supplies.

Scope of the project was to construct 22 km Kusum-Hapure 132 kV transmission line and 132/33 kV, 30 MVA substation at Panchakule of Dang.

Construction of Panchakule 132/33 kV, 30 MVA Substation was started on 5th Falgun 2065 (16th February 2009) and Kusum Hapure 132 kV Transmission Line on Poush 2073 (December 2016)). As per demand of local people, 33/11 kV, 8MVA Power Transformer was installed and put in operation on Poush 2075 (December 2018).

4. Kohalpur-Mahendranagar 132 kV 2nd Circuit Transmission Line

The objective of this project was to provide adequate power to western Nepal so as to meet the electricity demand requirement of ADB and Danida funded rural electrification projects in the region, providing power to the upcoming cement factories, to evacuate power from Chameliya HEP and supplying part of the Butwal area from Tanakpur Hydro power plant. The project cost was US$ 26.7 Million and jointly funded by GoN, NEA and ADB.

Scope of the project was to string 189 km second circuit transmission line from Kohalpur to Mahendranagar in existing towers with two new 132/33 kV substations at Pahalmanpur and Bhurigaon. Substation upgradation to double bus system and appropriate 132 kV bay extension at Kohalpur, Attariya, Lamki and Lalpur Substations has also been taken care by the project.

Transmission line construction works have been completed on Falgun 2073 (February 2017) and substations on Shrawan 2074 (July 2017). Work is

going on to demolish civil structures to clear the RoW and charge the line. Lamki-Pahalmanpur (29.4 km), Pahalmanpur-Attariya (35.4 km) and Attariya –Lalpur (36.6 km) Sections are charged on Falgun 2, 2075 (14th February 2019), Jesth 3, 2076 (17th May 2019) and Chaitra 23, 2075 (16th April 2019) respectively after clearing RoW.

5. Lamahi Ghorahi 132 kV Transmission Line

Objective of this project was to provide power supply to Ghorahi Cement Industry and Ghorahi Municipality. The project cost was US$ 4.3 Million and GoN through Ministry of Industry, Commerce and Supplies allocated budget for this work.

Project components includes construction of 12.5 km 132 kV double circuit transmission line from existing Lamahi Substation to Ghorahi Municipality-3, Jhingni and construction of 132/33 kV, 30 MVA substations at Ghorahi Municipality- 3, Jhingni.

Construction of Jhingni 132/33kV, 30 MVA Substation was completed and charged on 25th Baishak 2076 (8th May 2019) after completion of Lamahi-Ghorahi 132 kV Transmission Line on Chaitra 2075 (March 2019) and put in to operation.

6. Kabeli 132 kV Transmission Corridor (Second Section)

Objective of this project was to facilitate evacuation of power generated from Kabeli-A HEP as well as from Kabeli, Hewa, Mai and other river basin HEPs of eastern region. Construction of transmission line and associated substations will cater the increasing electricity demand of Damak area, relieve Anarmani substation and improve power supply situation in the eastern part of the country. Cost of this project was estimated US$ 31 Million and funded by WB, GoN, NEA.

The first Damak-Godak section comprising of a 35 km of transmission line and its associated substations at Damak and Godak was completed on 2072-06-09 and has started to evacuate power from Sanima Mai Khola (22 MW), Mai Cascade (8.0 MW) and more to INPS.

The second section comprising of a 43 km of transmission line from Godak to Phidim was completed and charged on 24th Baishak 2076 (7th May 2019) and has started evacuating power from Hewa Khola A (14.9MW) and other projects.

The third section comprising of a 13.33 km of transmission line from Phidim to Amarpur/Kabeli has been charged on 6th August 2019.

7. Rupani 132/33kV Substation

Objective of this project was to provide the reliable power to five different distribution substation of Saptari and Udaypur districts which was previously fed from Lahan substation through long double circuit 33 kV overloaded lines. The project cost was US$ 5 Million and funded by GoN.

The Rupani 132/33 kV, 63 MVA substation was charged on 13th Jestha 2076 (27th May 2019) and put in to operation. It has not only helped to reduce the technical losses, but also improved voltage quality in these areas.

In summary, the total transmission line length completed in this FY is 606 circuit km. Similarly, a total of 738 MVA substation capacity has been successfully upgraded and added to the system. The comparative tables of the length of transmission lines and capacity of grid substation in the last five fiscal years are given below.

Comparison of Transmission Line Length in last Five Fiscal Years

S.N.	FY	Circuit km				Total	Total Increment (ckt. km)
		66 kV	132 kV	220 kV	400 kV		
1	2071/072	494	2130	-	-	2624	-
2	2072/073	494	2417	-	-	2911	287
3	2073/074	494	2596	75	78	3243	332
4	2074/075	514	2717	75	78	3384	141
5	2075/076	514	3142.5	255	78	3990	606

Comparison of Substation Capacity in last Five Fiscal Years

S.N.	FY	Total Capacity (MVA)	Total Increment (MVA)
1	2071/072	2132	-
2	2072/073	2223	92
3	2073/074	2618	394
4	2074/075	3198	580
5	2075/076	3935	738

The details of existing, under construction, plan and proposed high voltage transmission lines/ substations are presented in Annexure B.

I.GRID DEVELOPMENT DEPARTMENT

This department is responsible for planning, developing, constructing, monitoring and commissioning of transmission line and substation projects up to 132 kV voltage level.

Brief summary of projects under different stages of development are presented below:

PROJECTS UNDER CONSTRUCTION

1. Thankot – Chapagaon – Bhaktapur 132 kV Transmission Line

Objective of this project is to enhance the transmission capacity, improve supply reliability, reduce loss and improve voltage through completion of 132 kV ring main in Kathmandu Valley. The project cost estimated US$ 23 million and project was jointly financed by loan assistance of ADB and OPEC, GoN and NEA. As project construction work delayed due to various RoW issues, previous contract has been terminated. Revised cost estimate for the remaining work in Lalitpur district is about US$ 3.5 Million and will be financed by GoN.

The revised project scope of work includes construction of remaining 18 km 132 kV double circuit transmission line in Lalitpur district and 2 km underground transmission line in Bhaktapur district.

As of July 2019, up gradation and construction of substations in Kathmandu valley and transmission line portion within Kathmandu and Bhaktapur Districts have been completed. However, construction of 18 km transmission line in Lalitpur district was stopped due to protest of local inhabitants demanding 100% RoW compensation. NEA is taking initiations and conduct dialogs with concerned people and authorities to complete the construction work.

2. Singati-Lamosangu 132 kV Transmission Corridor

Objective of this project is to evacuate power from hydropower projects being developed by IPP's in the Tamakoshi and Singati basin. Total cost of the project is about US$ 13 million and financed by GoN. The project was started in FY 2065/066 (2008/09) and the expected completion date is 15th Paush 2076 (31st December, 2019).

The scope of project includes construction of 38 km double circuit Singati-Lamosangu 132 kV transmission line with ACSR Bear conductor, 132/33 kV, 30MVA substation at Singati and 132 kV bay extension works at Lamosangu.

As of July 2019, about 80% construction works of substation and 85% of transmission line have been completed. Out of 125 towers, 118 tower foundations and 76 tower erection works have been completed. Conductor stringing works from both Dolakha and Sidhupalchok sections has been started. Stringing works for one circuit is expected to be completed by the end of September 2019.

3. Kusma-Lower Modi 132 kV Transmission Line

Objective of this project is to evacuate power from IPP projects and to provide N-1 contingency to power the plants in Modi basin. The project started in FY 2070/071 (2013/014) and expected to be completed in 2019/20. Cost of this project is estimated to US$ 3.5 Million and funded by GoN.

Scope of the project includes construction of 6.2 km 132 kV single circuit transmission line from Kusma to Lower Modi HEP and 132 kV Bay extension at Lower Modi.

As of July 2019, construction of transmission line is completed and testing and commissioning work is in progress.

4. Hetauda-Birgunj 66 kV Transmission Line Capacity Increment

The existing Hetauda-Birgunj 66 kV double circuit transmission line (having ACSR Wolf conductor) supply power to small and medium industries like Hetauda Cement, Hulas Steel, Jagadamba steel, Surya Nepal, Ashok Steel etc through direct tapping in 66 kV lines. The quantum of power required to supply these industries and substations is increasing day by day. Because of low current carrying capacity of existing ACSR Wolf conductor, these industries are getting unreliable, interrupted and voltage fluctuating power supply. To address this problem, project was initiated with the objective of replacing Wolf conductor with High Temperature Low Sag (HTLS) conductor which will increase the power transmission capacity by twice. Estimated project cost is US$ 3 Million and funded by GoN. Project started on FY 2072/073 (2015/016) and as per revise schedule its expected completion date is September 2019.

Project scope includes replacing of 115 km Wolf conductor with HTLS conductor and associated hardware from Simara substation to Birgunj substation via Parwanipur substation.

As of July 2019, type test of the INVAR (HTLS) conductor, supply of disc insulator and detail survey of the existing 66 kV transmission line from Simara (tower no 276) to Birgunj substation (tower no 353) have been completed.

5. Ramechap Garjyang Khimti 132 kV Transmission Line

Objective of this project is to evacuate power generated from IPP projects in Khimti and Likhu Corridor. The scope of works include construction of 31 km 132 kV of double circuit transmission line with ACSR Bear conductor from Ramechap (Garjyang) to Khimti and construction of Garjyang 132/33 kV, 30MVA and New Khimti 220/132 kV, 200 MVA substations. The project started in FY 2067/68 (2010/11) and is expected to be completed in the year 2020/21. The estimated cost is US$ 20 Million and funded by GoN.

As of July 2019, 80 tower foundations out of 105 has been completed, line materials like conductors, insulators, tower parts are in process to receive at site, civil construction works at Garjyang substation such as control building, transformer foundation, gantries foundation etc. have been completed. Power Transformers have reached at site and put on the respective foundations. For New Khimti S/S, tender has been floated.

6. New Modi-Lekhnath 132 kV Transmission Line

Objective of this project is to improve supply situation in the Dhaulagiri zone and to evacuate power from hydroelectric projects in Modi river basin of Parbat and Seti-Mardi-Sardi river of Kaski District. Cost of the project is estimated to be US$ 21.0 Million and jointly funded by EXIM Bank of India and GoN.

Both transmission and substation contracts have been awarded on 21st June 2018. As per contract schedule substation works will be completed on 20th December 2019 and transmission line works will be completed on 20th June 2020.

Project will construct 42.2 km of 132 kV double circuit transmission line with Bear conductor which connects the Modi HEP and Lekhnath substation through proposed New Modi & Lahachowk substation. It will also construct 132 kV Switching Substation at Korunga (New Modi) and 132/33 kV, 30 MVA new substation at Lahachowk.

Lahachowk Substation

Lahachowk Switchyard Foundation

As of July 2019, regarding substation construction land acquisition at Korunga (Parbat) and at Lahchowk (Kaski) is completed, construction of control building and switchyard foundation work is near to completion in both substations and about 60% of substation equipment has been delivered to site. Regarding transmission line check survey of 42 km line, land profiling and tower schedule has been completed, cadastral land survey has been carried out, some tower members, ACSR Conductors are delivered to site, 5 nos. of tower foundation out of total 138 towers has been completed.

7. Solu Corridor 132 kV Transmission Line

Objective of this project is to evacuate power from IPP's Projects of Solu river basin and commence rural electrification in Solukhumbu and Okhaldunga Districts. The estimated cost of the project is US$ 44 Million and jointly funded by GoN and EXIM Bank of India. Project initiated on FY 2067/068 (2010/11) and expected to be completed on 2019/20.

The project scope of works include construction of 90 km 132 kV double circuit transmission line with ACSR Cardinal conductor from existing 132 kV Mirchaiya substation (Siraha District) to 132 kV Tingla substation and construct 132/33 kV, 30 MVA and 33/11 kV, 8 MVA Tingla substation at Dudhkunda Municipality of Solukhumbu district.

As of July 2019, all the works at 132/33/11 kV Tingla substation has been completed. Further, construction of 2x4.5 km, 33 kV line from Belidada, Solukhumbu to Tingla substation has been completed. Regarding 132 kV transmission line construction out of 303 towers, 197 towers foundation work and 30 tower erection works has been completed. Forest clearance, Land acquisition and ROW clearance is taking more time than expected which makes difficult to complete the transmission line construction work in schedule.

132/33/11 kV Tingla Substation

8. Burtibang- Paudi Amrai- Tamghas- Sandhikharka- Gorusinghe 132 kV Transmission Line

Objective of this project is to extend the transmission line from Kapilvastu district to Arghakhachi, Gulmi and Banglung districts, which will limit the faults in distribution system and decrease the technical loss. It also provide the network for power evacuation of proposed hydroelectric projects in this region. The estimated cost of the project is US$ 30 Million and funded by GoN. This project was initiated in FY 2065/066 (2008/09) and as per revised schedule expected to be completed by 2020/21.

Scope of the project includes construction of 84 km, 132 kV double circuit transmission line with ACSR Bear conductor and construction of new 132/33 kV, 30 MVA & 33/11 kV, 16 MVA substations each at Motipur (Kapilvastu district), Sandhikharka (Arghakhachi district), Tamghas & Paudi-Amarai (both in Gulmi district) and Burtibang (Baglung district).

As of July 2019, civil construction works of office building, control building, guard house and store building in Motipur & Sandhikharka substation is in progress; evaluation of bid for Tamghas substation is ongoing; check survey, tree counting, design drawings approval for tower & foundation has been completed for Motipur - Sandhikharka section and check survey work and design review work is in progress for Tamghas-Paudi-Amarai - Burtibang Section.

9. Dordi Corridor 132 kV Transmission Line

Objective of this project is to evacuate power from IPP projects of Dordi river and its tributaries in Lamjung District. The cost of this project is estimated to be US$ 8.4 million and funded by GoN. The project has been initiated in FY 2068/69 (2011/12) and expected to be completed by 2019/20.

Scope of the project includes construction of 10.167 km long 132 kV double circuit transmission line from Kirtipur to Udipur with ACSR Cardinal Conductor and 132/11 kV, 10 MVA substation at Kirtipur.

As of July 2019, in the substation, switchyard foundation work is complete, control building, staff quarter building, guard house cum store building and boundary wall are under construction. Major substation equipment has arrived at site and installation process is about to start. Regarding the transmission line, ACSR Conductor (Cardinal) has been delivered at site and out of 33 towers, foundation work for 13 towers is completed and others are in the process of construction.

10. Kushaha (Inaruwa) - Biratnagar 132 kV Transmission Line

Objective of this project is to reinforce the power supply system in Morang, Sunsari district and to minimize overloading problem of existing Duhabi grid substation because of high power demand from local and Industrial area of Biratnagar. The cost of the project is estimated to be US$ 19 Million and is funded by GoN. The project is expected to be completed by 2020/21.

Scope of the project includes construction of 23 km, 132 kV double circuit transmission line from Inaruwa 400/220/132 kV substation to new Biratnagar substation at Ramganj Belgachiya with HTLS (ACSR Bear Equivalent) conductor and construction of new Biratnagar 132/33 kV, 2X63 MVA substation with 233 kVAr capacitor Bank for reactive power compensation.

As of July 2019, in the substation, civil construction work of control building, office building, store, guard house is in progress, foundation of major substation

Construction of Civil Structure

equipment is completed. Construction of 33 kV line has been delayed because of RoW problem in some of the places nearby road. For 132 kV transmission line tender has been called on June 2019 and evaluation of technical proposal of the received bids is going on.

11. Purbi Chitawan 132/33kV Substation

Presently, 132 kV substation at Bharatpur, which is approximately 21 km far from Parsa 33/11 kV substation at Chainpur, Chitwan is feeding energy to the East Chitwan area by 33 kV single circuit. Because of long length of 33 kV line voltage profile at distribution end is poor and line loss is higher. To provide reliable, quality and adequate power to East Chitwan area (Ratnanagar, Khairahani, Rapti and Kalika Municipality), 132/33/11 kV substation at Hardi-6, Chitwan is proposed. The project is initiated on FY 2072/073 (2015/016) and scheduled to be completed by 2019/20. Cost of this project is estimated to US$ 5.4 Million and funded by GoN.

The scope of works under this project includes construction of Purbi Chitawan 132/33 kV, 2*30 MVA substation including approximately 10 km of double circuit 33 kV sub transmission line to feed 33/11 kV Parsa substation and 10 km 11 kV distribution line.

As of July 2019, civil construction of boundary wall, guard cum store building and RCC culvert bridge are completed. Construction of control building, staff quarter building and equipment foundation works are in progress. Major substation equipment are in the process to dispatch after satisfactory completion

Construction of Boundary Wall

Construction of Control Building, Staff Quarter Building & Switchyard foundation is on progress

of factory testing and inspection.

12. Butwal-Lumbini 132 kV Transmission Line

The objective of this project is to enhance transmission capacity and improve supply quality, reliability, voltage, line loss in Rupandehi district through construction of 132 kV double circuit transmission line. The cost of the project is estimated to be USD 9.5 Million and funded by GoN. This project has been initiated in FY 2070/071 (2013/14) and is expected to be completed by year 2019/20.

The scope of project includes the construction of 18 km double circuit 132 kV Transmission Line from Butwal (Jogikuti) substation to Mainahiya substation with ACSR Bear conductor including 2 km underground cable and one 132/33/11 kV substation at Mainahiya with 132/33 kV, 2x45 MVA and 33/11 kV, 16 MVA power transformers.

As of July 2019, in the substation, civil construction

Mainahiya S/S Civil Works Progress

works including all 132 & 33 kV equipment foundation, cable trench, staff quarter, compound wall and about sixty percent of control building has been completed. Major substation equipment excluding power transformer have delivered to site. Regarding transmission line, check survey, tree counting, soil investigation of tower pad is completed and land acquisition for tower pad and tower design approval is in progress.

13. Chameliya- Syaule- Attariya 132 kV Second Circuit Transmission Line Project

Objective of this project is to reinforce the power supply system and lay down infrastructure for power evacuation from different IPP's in Darchula and Bajhang districts. Scope of this Project is to construct 131 km second circuit transmission line on same double circuit tower of existing Chameliya-Attariya 132 kV transmission line and bays extension work at associated substations. Cost of this project is USD 4.5 Million and funded by GoN. This project is initiated in FY 2074/075 (2017/018) and expected to be completed by 2019/20.

As of July 2019, 105 km of stringing works has been completed. For bay extension, civil works at Chameliya substation is completed and at Syaule substation construction is in progress and all major substation equipment for bay expansion has been delivered at site.

14. Bardghat - Sardi 132 kV Transmission Line Project

Objective of this project is to provide power supply to Hongshi - Shivam Cement Industry. Scope of the project includes construction of 20 km long 132 kV double circuit transmission line with ACSR Bear conductor from Bardghat substation to Sardi and 132 kV line bay extension at existing Bardghat substation. The cost of the project is estimated to be USD 4.0 Million and funded by GoN through Ministry of Industry, Commerce & Supplies. The project is initiated in FY 2073/074 (2016/17) and expected to be completed by 2019/020.

As of July 2019, out of 67 towers, 35 tower foundations have been completed, civil construction works including all 132 kV equipment foundation, staff quarters have been completed. Major substation equipment have been delivered to site. Land acquisition process for tower pad at Nawalpur east sector has been completed and for Nawalpur west sector is in progress. Acquiring permission for forest clearance under RoW from the Ministry of Forest and Environment is under process.

15. Kushaha Kataiya 132 kV Second circuit Transmission Line Project

Considering the sufficient power generation in Nepal and high power demand in India at wet seasons and vice versa scenario of power generation/demand in dry seasons, both countries government have planned to construct cross border transmission line to import/export the power. Kushaha-Kataiya 132 kV second circuit transmission line project is proposed for strengthening of Nepal-India power transmission line. Scope of this Project is to construct 16.5 km second circuit transmission line on same double circuit tower of existing Kushaha-Kataiya 132 kV transmission line and to upgrade existing Kusaha switching station to full phase substation with 132/11 kV, 22.5 MVA Power Transformer and necessary 132 kV line bays to connect transmission lines from Rupani, Duhabi and Kataiya substations. The estimated cost of the project is US$ 5.5 Million and funded by GoN.

As of July 2019, bidding process has started for the transmission line and substation works. Evaluation of received technical proposals is in process.

16. Nawalpur 132/33kV Substation

Objective of this project is to reinforce the power supply system and to cater load of Sarlahi District. The estimated cost of the project is US$ 6.9 Million which is funded by GoN. The project is initiated in FY 2074/75 (2017/18) and expected to be completed by 2020.

Scope of the project includes construction of

Nawalpur Substation with transformer capacity of 132/33 kV, 63 MVA; 33/11 kV, 16 MVA . It will also construct 10 km of 33 kV sub transmission line from Nawalpur substation to existing Haripur 33/11 kV substation to supply the reliable power in that area.

As of July 2019, Substation construction works has started. Boundary wall construction is completed and site preparation work for substation construction and staff quarter construction is going on. Approval of substation equipment design drawing is in progress.

17. Sunwal 132 kV Substation

The objective of this project is to provide power supply to Palpa Cement Industry as well as other existing industries in the Sunwal area and reinforcement of existing 33 kV distribution network. The cost of the project is estimated to be US$ 6.9 Million and funded by GoN through Ministry of Industry, Commerce & Supplies. The project is expected to be completed by 2020/21.

Main component of this project includes construction of Sunwal 132/33 kV, 2x63 MVA and 132/11 kV, 22.5 MVA capacity substation at Charpala, ward no 7 of Sunwal Municipality of Nawalparasi (Susta Paschim) district.

As of July 2019, IEE study is completed and approved by Ministry of Energy, Water and Irrigation. The Bid for above works has been invited and received technical proposals of the Bidder is in evaluation process.

PROJECTS UNDER PLANNED AND PROPOSED

1. Balefi-Barhabise Corridor 132 kV Transmission Line

Objective of this project is to evacuate power from different IPP projects at Balefi Corridor. Project will construct Pangtang-Bahrabise 20 km 132 kV double circuit transmission line with ACSR Cardinal Conductor and 132/33 kV, 30 MVA substation at Pangtang and necessary bay extension works at Barhabise substation. Initial cost estimate of the project is US$ 7.5 Million and funded by GoN. This project is initiated on FY 2072/073 (2015/016) and expected to be completed by 2021/22.

As of July 2019, the land acquisition for the Pantang (Balefi) substation has been accomplished. Construction of approach road, compound wall fencing and protection works has been completed at substation site. IEE study work is underway and is expected to be completed within Bhadra, 2076 (August 2019). Preparation of detail cost estimate for transmission line and substation construction work is under process to initiate tendering process.

2. Kohalpur-Surkhet-Dailekh 132 kV Transmission Line

Objective of this project is to meet the increasing demand of Surkhet and Dailekh districts, enhance quality, reliability of power supply and facilitate power evacuation from hydropower projects in Bheri, Babai and Karnali river basins of Karnali Province. Scope of project includes construction of 52 km Kohalpur-Surkhet 132 kV transmission line with ACSR Bear conductor, 32 km Surkhet-Dailekh 132 kV transmission line with ACSR Bear conductor, 132/33 kV substations at Surkhet and Dailekh.

In first phase, Kohalpur-Surkhet 132 kV transmission line will be constructed. Estimated project cost is US$10 Million and is funded by GoN. This phase is expected to be completed by 2021/22. It will be followed by construction of 132 kV line bays at existing Kohalpur Substation and new 132/33 kV Surkhet substation.

As of July 2019, Detail Survey and EIA study of the Transmission Line Route has been completed. Revised EIA report of Kohalpur-Surkhet section is submitted to concern ministry for approval. Tender document preparation is in progress.

3. Ghorahi-Madichaur 132 kV Transmission Line

Objective of this project is to reinforce the power supply system and facilitate power evacuation from different IPP projects at Madi Khola and Lungri Khola of Rolpa district and its tributaries. The project will construct about 36 km long 132 kV double circuit

transmission line from Ghorahi substation (Dang) to Khungri (Rolpa) and 132/33 kV, 45 MVA substation at Khungri of Rolpa along with 132 kV bay extension at Ghorahi substation. Estimated cost of the project is US$ 11 Million and shall be funded by GoN. This project is initiated in FY 2073/074 (2016/17) and expected to be completed by 2021/22.

As of July 2019, land acquisition for Khungri substation at Rolpa and detail survey of the transmission line route is completed. Environment impact assessment (EIA) study of the project is in progress and deemed to be completed by 2019/20. Currently, Civil works at Khungri substation is under execution aiming to construct office cum store building, compound wall along with others protection works.

4. Bhaktapur-Baneshwor-Patan 66kV Transmission Line Up-gradation

Objective of this project is to reinforce existing power supply system of Lalitpur and Kathmandu districts by upgrading the conductor of existing 66 kV transmission line from Bhaktapur via Baneshower to Patan. The project will replace about 20 km existing ACSR LGJ 120 sq. mm Chinese conductor and ACSR 'WOLF' conductor from Bhaktapur S/S to Suichatar S/S via Patan S/S and Baneshwor S/S with High Temperature Low Sag (HTLS) conductor. Estimated cost of the project is US$ 2.5 Million and funded by GoN. This project is initiated on FY 2074/075 (2017/18) and expected to be completed by 2020/21.

As of July 2019, final report including detail study of ground profile, RoW, conductor sag, tower structure, earthing and accessories and High Temperature Low Sag (HTLS) conductor to replace existing under sized conductor of Bhaktapur-Baneshwor-Patan-Siuchatar 66kV Transmission Line has been completed. Preparation for cost estimation and tendering document is in process.

5. Dhalkebar- Loharpatti 132 kV Transmission Line

Objective of this project is to reinforce the power supply system, cater increasing demand, enhance reliability and quality of power supply of Mahottari District. The project will construct 20 km long 132 kV double circuit transmission line from existing Dhalkebar substation to Loharpatti with one 132/33 kV, 60 MVA and 33/11 kV, 16 MVA substation at Loharpatti and also construct 10 km 33 kV line. Cost of the project is estimated to be US$ 11.3 Million and is funded by GoN.

As of July 2019, IEE, land acquisition for Loharpatti substation and land for bay extension at Dhalkebar substation have been completed. Tender document preparation is in progress for construction of line and substation.

6. Dadakhet Rahughat 132 kV Transmission Line

Objective of this project is to improve power supply situation in the Dhaulagiri zone and evacuate power from hydropower plants of Myadgi river and Kaligandaki river basins of Myadgi district. Project will construct 25 km, 132 kV double circuit transmission line with Cardinal conductor and also 132/33 kV, 30MVA substation at Dadakhet and 220/132 kV, 100 MVA substation at Rahughat (Rakhupiple) through LILO arrangement in 220 kV Kaligandaki transmission line. It is being under implementation with GoN funding. Estimated cost of the project is US$ 28 Million. This project is initiated in FY 2073/74 (2016/17) and expected to be completed by 2023/24.

As of July 2019, land acquisition of Dadakhet and Rahughat (Rakhupiple) substation is completed.

Survey works at Rahughat Substation

Dadakhet Substation

Construction of boundary walls, staff quarter & guard house at Dadakhet substation is in progress and shall be completed in next three months. The land profile survey has been completed. Preparation of transmission line tender document is going on.

7. Raxaul Parwanipur 132 kV Second Circuit Transmission Line

Considering the sufficient power generation in Nepal and high power demand in India at wet seasons and vice versa scenario of power generation/demand in dry seasons, both countries government have planned to construct cross border transmission line to import/export the power. Raxaul- Parwanipur 132 kV second circuit transmission line project is proposed for strengthening of Nepal-India power transmission interconnection and is a part of Nepal-India cross border transmission line. Scope of this project includes construction of 22 km second circuit transmission line on same double circuit tower of existing Raxaul-Parwanipur 132 kV transmission line and expansion of 132 kV bay at Raxaul and Parwanipur substation. Cost of this project is about US$ 15 Million and funded by GoN. This project is initiated on FY 2075/076 (2018/19) and expected to be completed by 2019/20.

8. Mainahiya - Sampatiya 132 kV Transmission Line

This project is being implemented for grid interconnection between Nepal and India to facilitate cross-border electricity trade between two countries. The Joint Steering Committee (JSC) on Nepal - India cooperation in power sector held on 24th January 2019 at Pokhara has agreed to proceed for the implementation of 132 kV cross border transmission line which interconnects Mainahiya (Nepal) and Sampatiya (India). The cost of the project is estimated to about USD 8.75 Million.

Scope of the project includes construction of 28 km double circuit transmission line with ACSR Bear conductor from 132/33/11 kV Mainahiya substation which is under construction in Nepal to the Marchawar (Shree Rampur) border point at Rupandehi district, Nepal.

As of July 2019, survey license has been issued by DoED, final detail design report has been prepared and MoU has been signed for IEE study. Preparation of project cost estimate is under progress.

9. Kaligandaki-Ridi 132 kV Transmission Line

Objective of this project is to increase the quality and reliability of electricity to Palpa, Gulmi, Argakhachi and Syangja district. In addition to that, NEA will supply 15 MW power requirement by CG Cement after the completion of Ridi 132 kV pooling station. Project is initiated in FY 2075/076 (2018/19) with the funding by GoN through Ministry of Industry, Commerce and Supplies.

The project scope of works includes construction of 21.8 km double circuit 132 kV transmission line, 132/33/11 kV substation at Ridi and 132 kV bay extension works at Kaligandaki HEP.

As of July 2019, survey works and land acquisition for Ridi substation have been completed. Draft survey report preparation is in progress.

10. Amarpur-Dhungesaghu 132 kV Transmission Line

Objective of this project is to interconnect Kabeli Corridor and Koshi Corridor Transmission Line projects so that the power from Kabeli Corridor 132 kV Transmission Line Project can be partially diverted to the Koshi Corridor 220 kV Transmission Line Project during normal operation. Also, in case of

any fault in the Kabeli Corridor in the lower sections this project intends to improve the reliability by diverting the power into Koshi corridor transmission line. Project is initiated on FY 2075/76 (2018/19).

The project scope of works include construction of 20 km double circuit transmission line from Amarpur, Panchthar to Dhungesaghu, Taplejung and necessary 132 kV bay extension works at respective substations.

As of July 2019, detailed survey works of the project has been completed and reports are under preparation. IEE works will be initiated through ESSD after one month.

11. Lalbandi-Salimpur 132 kV Transmission Line

Objective of this project is to improve the reliability of electricity supply in Salimpur area of Sarlahi district. The scope of works includes 20 km long Lalbandi-Salimpur 132 kV double circuit transmission line and necessary 132 kV bays extension at Lalbandi substation and new 132 kV substation at Salimpur. Project is initiated in FY 2075/76 (2018/19).

As of July 2019, detailed survey works of the project has been completed and reports are under preparation. IEE works will be initiated through the ESSD.

12. Keraun 132/33kV Substation

Keraun substation is located at Keraun, Kanepokhri rural municipality ward no-2 of Morang district. Objective of this project is to reduce overloading capacity of Duhabi 132/33 kV substation, meet the increasing power demand, reduce frequent tripping & outage and cater the 33 kV load of different 33 kV substation of Morang district. The project scope of works include construction of LILO (Line In-Line Out) arrangement in existing Duhabi-Anarmani 132 kV transmission line and 132/33 kV substation. This projected is initiated in FY 2075/076 (2018/19).

As of July 2019, land acquisition for substation is completed. Cost estimate and tender document preparation works are in process.

13. Dhalkebar – Balganga 132 kV Transmission Line

This project is intended for the voltage improvement & increase the reliability of supply system of Dhanusha district. Scope of the project includes construction of about 24 km long; double circuit 132 kV transmission line with Cardinal conductor and construction of 132/33/11 kV, 2x63 MVA substation at Balganga. The proposed line will originate from AP 13 of under construction Dhalkabar Loharpatti 132 kV Transmission Line and will be connected to the proposed Balganga substation. The Balganga substation will feed Mujelaiya, Yadukoha, Dhanusha Dham, Birendra Bajar, Lohna and Nagrain 33/11 kV substations.

The detailed feasibility study of the project is being done by Project Development Department, NEA. As of July 2019, detail survey of the line is complete and survey license has been obtained from DoED.

14. Bhumahi – Hakui Transmission Line

Objective of the project is to improve voltage stability at Nawalparasi District near Hakui Gaupalika and Nagarpalika areas. After construction of substation at Hakui Gaupalika area, the substation can feed power to the industrial sector at Hakui as well as power can be feed to nearby 33/11 kV substations. This project began on FY 2075/076 (2018/19) and funded by GoN.

Scope of the project includes construction of about 16 km long; double circuit 132 kV Transmission Line with Bear conductor and construction of 132/33 kV, 63 MVA Substation at Hakui.

As of July 2019, Project Development Department (PDD) is doing feasibility study of the project.

15. Godak – New Anarmani Transmission Line

Objective of the project is to improve voltage stability at Anarmani areas of Jhapa District. After construction of 132 kV transmission line from Godak to Anarmani, Anarmani substation can supply adequate, quality and reliable power in the region.

This project is initiated in FY 2075/076 (2018/19) and funded by GoN.

Scope of the project includes construction of about 35 km long double circuit 132 kV transmission line with ACSR Bear conductor and construction of new Anarmani 132/33 kV, 63 MVA substation. As of July 2019, feasibility study of the project is under progress.

16. Inaruwa – Dharan Transmission Line

Objective of the project is to improve voltage stability at Dharan, Dhankuta and Khandbari areas. After construction of substation at Dharan Municipality area, the substation can feed power to the industrial sector at Dharan as well as power can be feed to Bhedetar, Dhankuta and Khandbari 33/11 kV substations. This project initiated on FY 2075/076 (2018/19 and funded by GoN.

Scope of the project includes construction of about 25 km long; double circuit 132 kV Transmission Line with Bear conductor and construction of 132/33 kV, 63 MVA Substation at Dharan. As of July 2019, feasibility study of the project is under progress.

17. Kohalpur – Nepalgunj Transmission Line

The objective of this project is to improve voltage stability at Janaki Guapalika, Banke and Nepalgunj area. After construction of substation at Janaki Gaupalika area, the substation can feed power to the industrial sector currently developed in Janaki Gaupalika areas as well as power can be feed to Nepalgunj and Khajura 33/11 kV substations. This project began on FY 2075/076 (2018/19) and funded by GoN.

Scope of the project includes construction of about 20 km long; double circuit 132 kV Transmission Line with Bear conductor and construction of 132/33 kV, 63 MVA Substation at Nepalgunj.

As of July 2019, feasibility study of the project is under progress.

18. Pathlaiya – Harniya Transmission Line

The objective of this project is to improve voltage stability at Bara and Rauthat districts. After construction of substation at Harniya, the substation can feed power to 33/11 kV Simraungadh Substation, Gaur Substation, Kalaiya Substation and Maulapur Substation. This project was initiated on FY 2075/076 (2018/19) and funded by GoN.

Scope of the project includes construction of about 27 km long, double circuit 132 kV Transmission Line with Bear conductor and construction of 132/33 kV, 63 MVA Substation at Harniya.

As of July 2019, feasibility study of the project is under progress.

19. Sunkoshi 132 kV Substation

Sunkoshi 132 kV Substation Project was conceptualized to connect the existing Lamosangu 132 kV substation with proposed Barhabise 220/132 kV Substation at Sindhupalchok district. The basic purpose of the project is to increase the grid stability and balancing power and load at Lamosangu substation.

Scope of the project includes 12 km Single Circuit stringing with BEAR conductor on existing Transmission line towers and expansion of two 132 kV Line Bays at Barhabise Substaion, and one 132 kV Line Bay at Lamosangu Substation. This project has initiated on FY 2075/076 (2018/19) and funded by GoN.

20. Bafikot-Khungri 132 kV Transmission Line

Objective of this project is to reinforce the power supply system and power evacuation from different IPP's at Rolpa, Rukum (east) and (west) districts and its tributaries and it also interconnect Rolpa and Rukum district with INPS.

Project comprises of construction of about 75 km long 132 kV double circuit Transmission Line from Khungri substation of Rolpa district to Bafikot Substation of West Rukum district which crosses

various municipality/ VDC's of Rolpa, and Rukum (east) and Rukum (west). This project has initiated on FY 2075/076 (2018/19) and funded by GoN.

21. New Pokhara 132 kV Substation

Objective of this project is to reinforce the power supply system of Pokhara valley. The proposed site is located in south west side of existing Pokhara substation and is near lake side.

Scope of the project comprises of construction of 132/11 kV, 30 MVA GIS Substation at Pokhara Metropolitan City ward no 17 in NEA owned land. The substation will be powered by loop in and loop out facilities of Syangja- Lekhnath 132 kV transmission line by construction of 132 kV underground cable from substation to the termination tower. Project scope also include construction of 11 kV outgoing feeder up to the suitable connection point to enhance the capacity of existing feeders. This project has initiated on FY 2075/076 (2018/19) and funded by GoN. This project is in initial study phase.

22. Godak-Soyak 132 kV Transmission Line

Project is conceptualized to connect the existing Godak 132 kV substation with existing Soyak to Phidim 132 kV line at Soyak, Ilam district. The basic purpose of the project is to increase the grid stability and balancing power and load at Godak and Damak substation.

Scope of the project comprises of construction of 8 km 132 kV Double Circuit Transmission line with Bear conductor. This project is in initial study phase.

23. Lamahi Ghorahi 132 kV Substation Expansion

Objective of this project is to provide adequate power supply to east and mid region of Dang Valley. With completion of this project, it will be possible to meet present and future load demand in this region within permissible voltage profile.

Scope of the project comprises of construction of new 132/33 kV, 30 MVA substation at Ghorahi and Bay expansion at Lamahi. Bid for above works is under progress.

MAJOR 220 KV TRANSMISSION LINE DEPARTMENT

PROJECTS UNDER CONSTRUCTION

1. Khimti – Dhalkebar 220 kV Second Circuit Transmission Line Project

Objective of this project is to enhance the transmission capacity, improve supply reliability and to reduce losses and voltage drops in the grid through the construction of 220 kV double circuit line. Power generated from the Upper Tamakoshi HEP will be evacuated through this line resulting in voltage improvement of Dhalkebar substation. The project started in the year 2002. The project cost is estimated at US$ 22 Million and is jointly funded by World Bank, GoN, and NEA.

The scope of the project includes construction of 75 km long Khimti-Dhalkebar 220 kV transmission line on double circuit tower with single circuit of twin Bison ACSR conductor (initially charged at 132 kV) and two nos. of 132 kV line bays at Khimti and Dhalkebar substations in the first phase and stringing of second circuit in the second phase.

As of June 2019, only 7 km line of the 2nd circuit remains to be strung. The second circuit is scheduled to be completed by March 2020. The first line stringing was completed and charged back on January 17, 2017.

2. Chilime-Trishuli 220 kV Transmission Line

Objective of this project focuses on the development of power transmission facilities to evacuate the hydro power generated in the Upper Trishuli Valley by the planned expansion projects of NEA's subsidiary company Chilime Hydropower Company Limited notably Upper Sanjen, Sanjen and Rasuwagadhi and other Independent Power Producers (IPPs). The project started in the year 2009 (Contract date: December 20, 2017). The project cost is estimated at US$ 39 Million. The project is executed by Nepal Electricity Authority (NEA) and funded by Government of Nepal, Credit Institute for Reconstruction, Germany (KfW) & European Investment Bank (EIB).

The scope of the project includes construction of 27 km long 220 kV transmission line. The line has

Chilime Hub Substation Site after completion of cutting filling and compaction

two sections. One section is 19 km line of double circuit twin Bison ACSR conductor and the other section is 8 km line of four circuit twin Bison ACSR conductor. The scope also includes construction of 220/132/33 kV, 320 MVA substation.

As of June 2019, survey, soil investigation and site preparation works of substation have been completed. Construction of boundary wall and retaining wall are going on at the site. Most of the vendors, approval of General Arrangement Drawing, approval of drawings of most of civil and electrical components of the substation have been finalized.

Also, check survey, detail survey and soil investigation along with measurement of earth resistivity of transmission line are completed. Proto-testing of DD & DB tower is successfully completed. Vendors are finalized and the design drawings of different components of the transmission line are approved. Land acquisition process for tower pad is completed and the respective land owners are receiving the compensation. Excavation works for tower foundation on nine locations are going on. Stubs for DB & DD tower have been manufactured and they are being delivered at the site. Tree-cutting is approved from the ministry cabinet and the contract with the Forest and Soil Conservation Department is completed. The expected completion date is (Substation: December 31, 2019 & Transmission Line: February 29, 2020).

3. Koshi Corridor 220 kV Transmission Line Project

For its size, Nepal has a great potential for hydropower generation. From the Arun and her tributaries alone, more than 3,000 MW capacity has been identified and some IPPs are already under various stages of progress. Koshi Corridor 220 kV Transmission Line Project was proposed with the objective of evacuating that power to the national grid and it is now under construction. The project area covers the five districts viz. Taplejung, Sankhuwasabha, Terhathum, Dhankuta and Sunsari. The project is being financed under the Exim Bank of India US$ 250 Million Line of Credit supported by the Government of India. US$ 90 Million has been set aside for the construction of the project out of US$ 250 Million line of credit to the government of Nepal.

The scope of this project has been split into three

Tower foundation under construction

packages: Package- KC1, Package-KC2, and Package- KC3.

Package-KC1, signed with M/s Kalpataru Power Transmission Limited, India on June 2016 with a contract value of US$ 37.5 Million, covers the construction of 105 km long 220 kV level Double Circuit Transmission Line from Inaruwa-Basantapur-Baneshwor-Tumlingtar. This 105 km long line can be further segmented into two sections: the 30 km long twin section from Tumlingtar to Basantapur via Baneshwor, and the 75 km long quad section from Basantapur to Inaruwa. Both sections shall carry

Moose ACSR conductors and, under the present scope, shall be strung on one side only.

Package-KC2, signed with M/s Larsen and Toubro Limited, India on October 2018, with the contract value US$ 25.3 Million, covers the construction of substations at Tumlingtar (220/132/33 kV, 7X33.33 MVA single phase Bank with one transformer as spare), Baneshwor (220/33 kV, 2X25/30 MVA three phase) and Basantapur (220/132/33 kV, 7X100 MVA single phase bank with one transformer as spare), and 2 bay extensions at Inaruwa substation.

Package-KC3, signed with M/s KEC International Limited, India, on June 2018 with the contract value US$ 21 Million, covers the construction of 132/33 kV substation at Dhungesangu, Taplejung and a 35 km long 220 kV Double Circuit transmission line from Dhungesangu Substation (132/33 kV, 7x5 MVA single phase bank with one transformer as spare) to Basantapur Substation. Although, the design is of a 220 kV double circuit, the present scope is limited to single line stringing to be charged at 132 kV.

Construction of KC1 started simultaneously from

Stringing work undergoing in plain section

three different sections and as of June 2019, 253 tower foundations and 135 tower erections out of 320 towers have been completed. Stringing of a 5 km stretch has also been completed. Similarly, earthing work and construction of revetment wall is also under progress. In case of Package KC2, construction of all three substations is under progress. In Tumlingtar Substation: site development work has been completed, and construction of transformer foundation, gantry tower foundations, and control-room building is under progress. In Baneshwor Substation, site development work has been completed and construction of stone masonry wall is under progress. In Basantapur Substation, site development work is ongoing. Under Package KC3, cadastral survey has been finalized and compensation has been fixed. 11 out of 125 tower foundations have been completed and parts for 100 towers have been supplied.

The expected completion date for Package- KC1,

Tower erection ongoing

Package-KC2 and Package- KC3 are May 2020, June 2020, and December 2020 respectively.

4. Lekhnath-Damauli 220kV Transmission Line

Objective of this project is to augment the power evacuation capacity of the Integrated National Power System from the western basin of Nepal with the construction of a 220 kV, 45 km long double circuit transmission line with Moose ACSR conductor from New Lekhnath to New Damauli, and 220/132/11kV substations at Lekhnath (320 MVA) and New Damauli (64 MVA). Cost of this project is estimated at US$ 65 Million. The project will be funded by the Government of Nepal and Credit Institute for Reconstruction, Germany (KfW). The project is

expected to be completed on June 2023.

As of June 2019, detailed survey, feasibility study, and IEE have been completed. Land acquisition for Damauli substation, procurement of the Project Implementation Consultant (PIC), and the Environment and Social (E&S) Consultant are under progress.

5. Trishuli 3B 220 kV HUB Substation

There are numerous projects in progress in the Trishuli basin, namely: Upper Trishuli 3A, Upper Trishuli-1, Upper Trishuli 3B, Sanjen, Rasuwagadhi and other IPPs in 220 kV voltage level. The objective of this project is to evacuate those power via Trishuli-Matatirtha Transmission Line to National Grid. The Trishuli 3B 220 kV substation will act as a hub to accommodate around 600 MW power that is soon to be generated from the Trishuli river basin. As such, this hub is in a prominent position in the national grid and in the national economy. The project cost is estimated to be US$ 16 Million with the joint funding of Government of Nepal, Credit Institute for Reconstruction, Germany (KfW) and European

Overall Site view

Investment Bank (EIB). Contract was signed with M/s PINGGAO GROUP CO., LTD (China) on November 13, 2017 with the contract value of US$ 12.5 Million and the contract was effective from December 20, 2017.

The scope of the project includes construction of 220/132/33 kV, 7x53.33 MVA Trishuli 3B Hub Substation. The substation includes two Banks of 160MVA Auto transformers formed with 7 numbers of 220/132 kV, 53.33MVA Single phase auto transformers and 50 MVA, 132/33 kV, 3 Phase Power Transformer. The 220 kV bays will be of Hybrid GIS type.

As of June 2019, the overall physical progress of the project is 62%. The progress on design/drawing is about 90%. Though site development work was a challenge, 90% of that task has been completed. Preliminary works such as quarter building and boundary walls were completed last year. Foundations of almost all single phase auto transformers are complete. Foundations of gantry structures and other equipment like CB, CVT, and Isolator etc. are under construction. Control-room building is being constructed and construction of transit camp is about to start as well. Rivulet RCC work is almost complete and river protection work is under progress. Gabion protection works and RRM works are on the verge of completion.

Various studies such as the feasibility study, SEP, IEE, ESIA & LACP were completed in different phases of the project; technical, social & environmental monitoring & implementation is under progress with support from ESSD, NEA, and the Consultant POWERGRID, India.

As the need for power evacuation various IPPs is rather urgent (250 MW in FY 2076/77 and 350MW in near future), this project is given a high priority and is scheduled for completion by December 31, 2019.

PROJECTS UNDER PLANNED AND PROPOSED

1. Tumlingtar-Sitalpati 220 kV Transmission Line

The substation at Sitalpati is proposed to cater power produced by the various IPPs in the region, and, by virtue of its connection with Tumlingtar, evacuate said power to the national grid. The construction of this line will reduce the transmission line congestion

at Tumlingtar. The cost for the construction of transmission line and substation including land acquisition, RoW compensation and other expenses is estimated to US$ 2.8 Million.

The scope of the work consists of construction of 15 km long, 220 kV, Double Circuit Transmission Line from Tumlingtar to Sitalpati in Sankhuwasabha District with Twin Moose ACSR Conductor. It also includes the construction of new substation at Sitapati (220/132/33 kV, 200 MVA) and 2 bays extension at Tumlingtar substation. However, the sizing and capacity will be finalized during detail engineering phase of the project.

As of June 2019, land acquisition for construction of substation at Sitalpati has been completed. Detail survey of the transmission line as well as tower spotting has been completed. Topographical survey of the substation has also been completed. IEE of the transmission line and substation is under progress.

2. Borang-Ratmate (Naubise) 220 kV Transmission Line

Objective of this project is to evacuate the hydroelectric power generated by IPPs of Aankhu Khola Corridor to the Integrated Nepal Power System and to augment the same. Cost of this project is estimated to be US$ 35 Million, to be funded by GoN; the project is expected to be completed by June 2022.

The scope of this project extends to the construction of a 26 km long, 220 kV double circuit transmission line with twin Moose conductor from proposed Lapan 220/132/33/11 kV substation to proposed Ratmate 400/220 kV substation and that of a 23 km long, 132 kV double circuit transmission line with Bear conductor from proposed Borang 132/33/11 kV substation to proposed Lapan 220/132/33/11 kV substation.

As of June 2019, detailed survey, feasibility study, and IEE have been completed. The land acquisition for the substation is under progress.

3. Trishuli 3B - Ratmate 220kV Transmission Line Project

Objective of this project is to increase power evacuation capacity of the IPP's connecting at Trishuli 3B Hub Substation. Additionally, the line will upgrade the capacity and reliability of the Integrated Nepal Power System (INPS). The project is located in Nuwakot District.

In the scope of this project is the construction of about 24 km long double circuit 220 kV transmission line with twin moose conductor from Trishuli 3B Substation Hub to Ratmate 400/220 kV Substation and 220 kV bay extensions at Trishuli 3B Hub and Ratmate Substations. Ratmate 400/220 kV substation is going to be implemented by Millennium Challenge Account Nepal (MCAN) under the compact agreement between the GoN and Millennium Challenge Corporation (MCC), USA.

As of June 2019, the detail Survey of the line is completed and the feasibility study of the project is

being done by NEA Engineering Company Limited, Kathmandu.

MAJOR 400 KV TRANSMISSION LINE PROJECT

PROJECTS UNDER CONSTRUCTION

1. Hetauda- Dhalkebar-Inaruwa 400 kV Substation Expansion

Objective of this project is to serve as a backbone to transmission line system in the national grid of Nepal. The Dhalkebar 400 kV substation will be connected to the Muzaffarpur substation via. Dhalkebar- Muzaffarpur 400 kV cross border transmission line that and will also be connected to Hetauda and Inaruwa via Hetauda-Dhalkebar-Inaruwa 400 kV Transmission Line. The Dhalkebar-Muzzaffarpur cross-border link will facilitate the exchange of electricity between Nepal and India in which electricity from India will be imported in the dry season and exported from Nepal in the monsoon. This project was started in the fiscal year 2017/18. The estimated project cost is around US$ 60 Million and it is funded by Government of Nepal/Nepal Electricity Authority.

The scope of this project is to construct 400/220 kV substations at Hetauda, Dhalkebar and Inaruwa. The scope of Hetauda substation includes 400/220 kV, 4X167 MVA autotransformer and its associated bays; 400 kV, 50 MVA Bus Shunt Reactor and its associated bay and 400 kV GIS bays for the termination of 400 kV Double Circuit lines from Dhalkebar. The scope of Dhalkebar substation includes 400/220 kV, 3X315 MVA autotransformer and its associated bays; 400 kV, 80 MVA Bus Shunt Reactor and its associated bay and 400 kV line bays for the termination of 400 kV Double Circuit lines from Hetauda, Inaruwa and Muzaffarpur (India). The scope of Inaruwa substation includes 400/220 kV, 3X315 MVA autotransformer and its associated bays; 400 kV, 55 MVA Bus Shunt Reactor and its associated bay; 400 kV line bays for the termination of 400 kV Double Circuit lines from Dhalkebar. All three substations are 400 kV gas insulated switchgear (GIS) type with one and half breaker busbar scheme. These substations will be equipped with a state-of-the-art control, protection and automation system based on IEC 61850 open standards to facilitate communication between numerous devices within the substation and beyond.

As of June 2019, NEA Engineering Company has been appointed as a design check and construction supervision Consultant for this project. For the construction of 400 kV GIS Substation at Dhalkebar, Contract has been awarded to ABB India Limited on December 2017 and is scheduled for completion by the end of December 2019. Similarly, for the construction of 400 kV GIS Substation at Hetauda and Inaruwa, Contract has been awarded to Siemens Limited, India on December, 2018 and scheduled to be completed by the end of September 2020.

As of now, for Dhalkebar Substation majority of the engineering design drawings has been approved. Majority of supplies like 400 kV GIS, 400 kV CVT, 400/220 kV Surge Arrester, Control Relay Panel, Substation Automation System, Pre-Engineered building (PEB), Structures, Electric Overhead Travelling (EOT) crane etc. are delivered at site. Out of three transformers, first unit 315 MVA, 400/220 kV transformer and 80 MVAr, 400 kV Bus Shunt Reactor, Factory Acceptance Test completed on June, 2019. The second and third unit of transformers Factory Acceptance Test is scheduled on August 2019. At site, till now, PEB building for GIS, Transformers/ Reactors foundations, Gantry towers/equipments

Under construction 400 kV GIS Substation at Dhalkebar

foundations are about completion and control room building/GIS Busduct foundations, road, drains etc. are in progress. The site erection activities of Gantry Towers/Beams, equipments structures, PEB buildings are under progress and major erections for GIS, transformers etc. will be started by August 2019.

As of now, for Hetauda and Inaruwa Substations the approval of engineering design drawings are in advanced stage as majority of engineering was already completed. Majority of equipments like 400 kV GIS, 400/220 kV outdoor equipments, transformers/reactors etc. are under manufacturing stage. At Hetauda site, drain shifting works and control-room building foundation works are in progress whereas, at Inaruwa, soil filling and stone pile works below the foundations are in progress. The project is likely to complete by the Year 2021.

2. Bheri Corridor 400 kV Transmission Line

Objective of this project is to evacuate power from Uttarganga Hydro Power Project as well as IPP's upcoming in the Sani Bheri river basin and its tributaries. Power transmitting capacity of this line has not been finalized and will be designed as the future dictates. The project started in the year 2015. This project was initiated by Nepal Government (NG) under Energy Crisis Eradication budget head to electrify Rukum (West) district, since it hasn't been connected to National grid yet.

The scope of the project comprises of construction of about 25 km long 400 kV double circuit Transmission Line from Bafikot (Rukum west) to Nalsingadh Hydropower project (Jajarkot), which crosses various municipality/VDC's of Rukum (West) & Jajarkot district. Also it includes with one 400/132 kV, 150 MVA Uttarganga substation hub at Bafikot, Rukum (West).

As of June 2019, the land acquisition for the Uttarganga substation hub at Bafikot, Rukum (West) has been completed after a deadlock of around 3 years due to numerous reasons. Detail field survey of substation areas, line route, IEE works along with preparation of office estimate and tendering for civil works is aimed to be started by this year.

3. Ratmate-Rasuwagadhi-Kerung 400 kV Transmission Line

The Ratmate – Rasuwagadhi - Kerung 400 kV Transmission Line Project is being implemented as the first power grid interconnection of Nepal with China in line with the government policy to ensure energy security by facilitating cross-border electricity trade between Nepal and Tibet autonomous region of China. This will open new avenues in terms of electricity market in Nepal and China. The project started in the year 2017. The project cost is estimated at US$ 96.79 Million. The funding agency has not been finalized yet. However, pre-feasibility study being funded by Nepal Government

Scope of the project consists of design, supply and construction of about 70 km of 400 kV double-circuit transmission line with Quad Moose ACSR conductor from Rasuwagadhi border point at Rasuwa district to Ratmate substation at Nuwakot district. Furthermore, a converter station is to be constructed at Gyirong County, Tibet and a 400 kV substation is to be constructed at Ratmate, Nepal for evacuation of the power to load centers.

As of June 2019, the detail survey works for this project is being carried out by the Project Development Department (PDD), Engineering Services Directorate of NEA, while the draft report has been submitted. For the study of environmental impact, proposals have

Cooperation Agreement between the State Grid Corporation of China and NEA

been collected and are currently being reviewed. Moreover, the project is currently in the process for obtaining permission, from Department of National Parks and Wildlife Conservation, Nepal Government, to carry out feasibility study/ environmental study as about 5 km of the proposed route alignment passes through Lamtang National Park.

NEPAL-INDIA ELECTRICITY TRANSMISSION AND TRADE PROJECT (NIETTP)

Nepal-India Electricity Transmission and Trade Project (NIETTP) funded by World Bank began with the objective of establishing high voltage cross-border transmission link capacity of about 1,000 MW to facilitate exchange of power with India and to improve the reliability of electricity supply. Furthermore, under NIETTP additional funding, construction work of Hetauda-Bharatpur-Bardaghat 220 kV transmission line and concomitant 132 kV substations at Hetadua, Bharatpur and Bardaghat is being executed. In addition, Transmission System Master Plan of Nepal has been prepared under this project which is now being implemented by NEA. All substations are Air Insulated Switchgear (AIS) type with double main and transfer bus bar scheme for 220 kV and double main bus bar scheme for 132 kV. These substations will be equipped with a state-of-the-art control, protection and automation system based on IEC 61850 open standards to facilitate communication between numerous devices within the substation and beyond.

PROJECTS UNDER CONSTRUCTION

1. Hetauda-Dhalkebar-Inaruwa 400kV Transmission Line

Objective of this project is to establish high voltage cross-border transmission link capacity of about 1,000 MW to facilitate exchange of power with India and to improve the reliability of power supply. The project started in the year 2012. The estimated project cost is around US$ 150 Million and is funded by World Bank. The Power Grid Corporation of India (PGCIL) was appointed as a design check and construction supervision consultant for 400kV Hetauda-Dhalkebar-Inaruwa Transmission Lines and Hetauda-Dhalkebar-Inaruwa 220 kV substations construction works. For the construction of Hetauda-Dhalkebar-Inaruwa 400 kV Double circuit Transmission lines, contract has been awarded to AIL-LTB JV on February 3, 2013.

Erected Gantry Towers at 220/132 kV Hetauda Substation

The scope of the project includes design, supply and construction of approximately 288 km of Hetauda-Dhalkebar-Inaruwa 400 kV, Double Circuit Quad Moose ACSR conductor transmission line with concomitant 220 kV substations at Hetauda, Dhalkebar and Inaruwa.

The scope of Hetauda substation includes 220/132 kV, 2X100 MVA and 132/11 kV, 10 MVA Transformers and its associated bays, and 220 kV line bays for the termination of 220 kV Double Circuit lines from Bharatpur. The scope of Dhalkebar substation includes 220/132 kV, 2X160 MVA Transformer and its associated bays, and 220 kV line bays for the termination of 220 kV Double Circuit lines from Khimti. The scope of Inaruwa substation includes 220/132 kV, 2X100 MVA and 132/11 kV, 2X63 MVA Transformers and its associated bays; 132 kV, 25 MVAr Bus Reactor and its associated bay; 220 kV line bays for the termination of 220 kV Double Circuit lines from Basantpur and 132 kV line bays for loop in loop out of existing 132 kV Double Circuit lines from Lahan to Duhabi. All substations are Air Insulated Switchgear (AIS) type with double main and transfer bus bar scheme for 220 kV and double

main bus bar scheme for 132 kV. These substations will be equipped with a state-of-the-art control, protection and automation system based on IEC 61850 open standards to facilitate communication between numerous devices within the substation and beyond.

220 kV Substation at Dhalkebar

As of June 2019, out of 792 tower pads, 582 foundations have been completed and 530 towers have been erected. The remaining parts mostly fall in the forest area and the process of tree cutting and stacking along the right-of-way of the route is under process in different districts. Pile foundation work at Koshi River has been started.

Similarly, for the construction of 220/132 kV Substation at Hetauda, Dhalkebar and Inaruwa, Contract was awarded to Central China Power Grid International Economic & Trade Co., China on June, 2014 but due to non-performance of the contractor, the contract was terminated on September 22, 2017. After termination of the contract, 220/132 kV Dhalkebar substation balance works has been awarded to M/s Telmos Electronics on January 23, 2018. Initially, Dhalkebar-Muzzaffaur 400 kV Transmission Line was charged at 132kV importing 100 MW power from India. After successfully charging of 220 kV Dhalkebar substation at 220 kV voltage level on August 16, 2018, 260 MW power is importing during peak hours through Dhalkebar-Muzzaffaur 400 kV Transmission Line at 220 kV.

In addition, the 220/132 kV Hetauda and Inaruwa substation balance works has been awarded to M/s Consortium of Siemens Limited and Telmos Electronics on December 20, 2018. Now, the contractor has been mobilized and started work on both Hetauda and Inaruwa substation. The project is expected to be completed by the year 2020.

2. Hetauda – Bharatpur - Bardaghat 220kV Transmission Line

This World Bank funded project started in 2008 with the objective of enhancing the transmission capacity and bolstering the reliability of the Integrated Nepal Power System (INPS). With its 220 kV transmission line the project aims to evacuate the power to be generated by various hydropower plants and to serve as a highway for the power flow from the western to eastern region of Nepal and vice versa.

2.1 Bharatpur-Bardaghat 220 kV Transmission Line

In the scope of this project is the construction of a 74 km long, 220 kV Double Circuit Transmission Line with Twin Bison ACSR Conductor (initially charged at 132 kV) from Bharatpur to Bardaghat. After the termination of contract with M/S Central China Power Grid International Economic & Trade

Foundation Work

Erection Work

Co. Ltd, China (CCPG) on June 5, 2017, new contract for balanced work (contract No. NIETTP/BB/AF/5/ICB) was awarded to M/S Hengton-Optics Electric Company, China on August 6, 2018 with the contract value of US$ 5.5 Million.

As of June 2019, out of 246 tower pads, 149 tower foundations and 117 tower erections have been completed. About 85% of the site is cleared and remaining section will be cleared after the forbidden period of forest (from June to September). The tender for tree cutting of the remaining sections has been awarded. The line is expected to be completed by January 20, 2020.

2.2 Hetauda-Bharatpur 220 kV Transmission Line

The scope of this project is construction of 74 km long, 220 kV double circuit transmission line with twin Bison ACSR Conductor (to be charged initially at 132 kV) from Hetauda to Bharatpur. The contract with M/s ICOMM Tele Ltd, India for the same was signed on March 9, 2009 with the contract value of US$ 15.3 Million. The scope also includes construction of new 132 kV substations at Hetauda and Bharatpur and bay extensions at Old Hetauda and Bardaghat Substations. The contract with M/S ZHONGDING INTERNATIONAL Co. LTD., CHINA for the same was signed on December 16, 2009 with the contract value of US$ 5.8 Million.

As of June 2019, the overall progress of the construction of substation is about 93%. Almost all the equipment have been supplied and the installation works is about to complete.

Hetauda Bharatpur line section: out of 226 tower pads, 173 tower foundations have been casted, 119 towers have been erected, a 16 km stretch has been strung and almost 97% of the tree cutting and its supplementary tasks have been completed. Almost all compensation amount has been disbursed barring only the unregistered land. The contract with M/s ICOMM Tele Ltd, India, was terminated on 29th April, 2019. For what remains, project has prepared the tender documents that will soon be floated.

New Bharatpur Substation

PROJECTS UNDER PLANNED AND PROPOSED

1. New Anarmani-Inaruwa-Arun-Dudhkoshi-Tingla 400 kV Transmission Line

As a part of project preparation studies, under the Power Sector Reforms and Sustainable Hydropower Development Project funded by the World Bank, NEA has undertaken the feasibility study and detail design of three transmission lines and concomitant substations namely (i) about 100 Km long Inaruwa-New Anarmani 400 kV Transmission Line and substations (ii) about 130 Km long Inaruwa-Arun 400

kV Transmission Line and associated Substations (iii) about 115 Km Long Arun-Dudhkoshi-Tingla 400 kV Transmission Line and associated substations. The selection of consulting process has been initiated and is at its final stage of selection. The study is expected to begin from August 2019 and will be completed by January 2021.

SYSTEM OPERATION DEPARTMENT

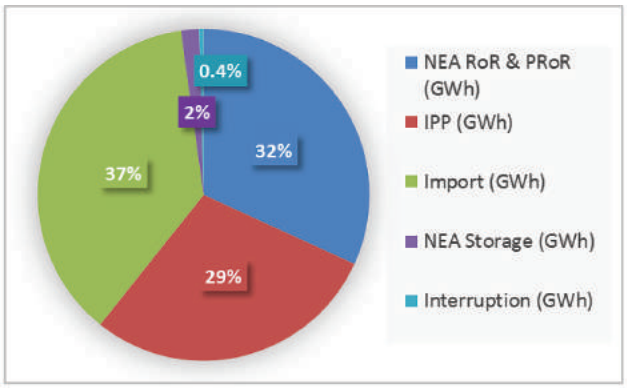
System Operation Department (SOD) has the main responsibility of managing & controlling reliable and quality power from distant generators to various load centers through Load Dispatch Centre (LDC) centrally located at Siuchatar, Kathmandu. As of now, Load shedding was completely eliminated and hence the focus of SOD has now shifted more towards maintaining quality and security of power supply. Skillful handling of system by operator, effective short term planning, daily scheduling of energy and power of INPS has made possible to optimize available generation and power import from India. This enables LDC to accomplish economic dispatch of power, maintaining voltage and frequency of the system within standard which contribute significantly to improve financial health of NEA. In last fiscal year Dhalkebar- Muzzaffarpur and Upper Trisuli Three A-Matatirtha transmission line were energized at 220 kV and 132 kV voltage level respectively which contribute significantly to strengthen the transmission network and system operation. The major highlights of the system are given in the table below.

1	Annual Peak Demand	1320.28 MW
2	Energy Demand	7583.92 GWh
3	Annual Load Factor	65.57%
4	EXPORT	42.5 GWh

The major contribution of energy in the INPS for the fiscal year 2075/76 are given below.

The details of System Load Curve (dry and wet peak), capacity and energy balance and energy export to India are presented in Annexure A.

LDC under SOD has been working round the clock



Total Energy Contribution F.Y. 2018/19 (2075/76 BS)

to keep the operation of the Integrated Nepal Power System (INPS) on the right track by using computer based Supervisory Control and Data Acquisition (SCADA) tools. The availability of real time data and better communication system have improved the overall availability of power stations and transmission lines which have helped towards fast restoration of the power system in case of black-outs, thereby reducing loss of revenue.

For the continued smooth functioning of the INPS, it is necessary that the data acquisition from the power stations and substations be updated according to the latest changes/modifications in the respective stations. This year syaule, Bhurigaun and Pahalmanpur substations have been integrated in SCADA system. The trained manpower in the LDC has been able to keep the data up-to-date in the SCADA software in the LDC, through the regular maintenance works. Significant amount of revenue is being received annually by leasing (to Nepal Telecom and other private companies) optical fiber cable.

In future, NEA is going to synchronize Indian system with INPS. The objective of this scheme includes installation of SPS (Special protection Scheme), Communication and SCADA system within the Nepalese power system for synchronous operation of the Nepal grid and Indian grid. For the same, Joint NEA and Indian team had already visited different substations within Nepal. The study suggested that synchronization of two grids shall be achieved with installation of SPS system at existing Dhalkebar, Chandranigahapur, Kamane, Bharatpur, Butwal, Hetauda, Bhaktapur and Lamahi substations and

some strengthening on protection, communication system of present INPS. NEA has already requested to Power grid cooperation of India (PGCIL) for submission of techno-commercial proposal towards implementation of SPS and communication system.

Synchronization of two grids will increase the reliability and security of the INPS system as well as creates opportunity of power exchange between two countries through electricity market transaction.

PROJECTS UNDER CONSTRUCTION- LDC UPGRADATION PROJECT

Objective of this project is to upgrade the existing LDC master station with the latest SCADA/EMS (and related hardware, incl. central IPABX - system) and enhance the capacity of the LDC in a way to meet the expansion works of INPS (Integrated Nepal Power System) and contribute towards the smooth operation of INPS and also to establish an emergency / backup control Centre in Hetauda that will help to increase the availability of the power system control facilities and will increase the flexibility in power system operation.

For the scope of rehabilitation of existing LDC at Suichatar includes a complete new version of SCADA system for the control of the country's transmission system is to be supplied. Beside Basic SCADA functionality the control system shall also include energy management system (EMS) and network application (NA) functions whereas scope of Emergency / Backup Control Centre (ECC) at Hetauda includes the installation of same hardware components as the main LDC which shall act as a backup centre for the main LDC in Kathmandu and shall allow the control of the countries transmission system in case of emergency or failures of the main load dispatch Centre.

All required hardware and software have been supplied and installation of Video projection system, servers, IPABX and UPS have already completed in main LDC. The Site Acceptance Test (SAT) of hardware and software are scheduled in near future. The construction work of emergency control center building which acts as a backup for main LDC has been already completed in premises of New Hetauda s/s at Hetauda. In synopsis installation phase of project is completed in LDC, testing phase will begin soon. In back up LDC installation from contractor side is yet to be started.

VPS Installation at LDC, Suichatar

This project was funded by grant assistance to Nepal Government by KFW, the German Bank. The contract cost of project is Euro 1972239 and NRs. 2375953. The consultant cost for tendering phase is Euro 129170.06 and for supervision of project is Euro 532178.50. The start date of project is Jan 31, 2018 and expected completion date is 31st December, 2019.

GRID OPERATION DEPARTMENT

Grid Operation Department (GOD) has the main responsibility of transmitting reliable and quality power from distant generators to various load centers. The department also provides connection facilities to IPPs and Bulk Consumers at different voltage levels by accomplishing Connection Agreement as per NEA Grid Code. The other major responsibility of this department is to look after the operation of 66kV & above voltage Substations and Transmission Lines along with routine and breakdown maintenance works including up-gradation, extension, replacement works, reactive compensation, rehabilitation works etc. Apart from that GOD is also looking after the operation and maintenance of Nepal portion of 400kV Dhalkebar - Muzzaffurpur Transmission line charged at 220 kV Voltage level which is owned by Power Transmission Company of Nepal (PTCN). The three division offices

in Kathmandu, Hetauda, Butwal and four branch offices in Duhabi, Pokhara, Attaria & Dhalkebar are working under GOD for the fulfillment of these responsibilities.

Kathmandu Grid Division

Kathmandu Grid Division has its office located at Meenbhawan, Baneshwor of Kathmandu district. This division is responsible for Operation and Maintenance of 15 Substations in and around the Kathmandu Valley namely Balaju, Siuchatar, New Chabahil, Lainchaur, New Patan, Teku, K3 (Singhdurbar), Baneshwor, Bhaktapur, Banepa, Panchkhal, Lamosanghu, Matatirtha, Chapali and Indrawati along with 66 kV and above voltage transmission lines which are connected to the Kathmandu mainly from Chilime, Khimti, Trishuli, Devighat and Marsyangdi. Kathmandu Grid Division is also responsible for Operation & Maintenance of all transmission lines inside the Kathmandu Valley.

Hetauda Grid Division

Hetauda Grid Division has its office located at Chowkitole, Hetauda of Makwanpur district. The major responsibility of this division is to look after the operation and maintenance of 66 kV & above voltage substations and transmission lines located in the Central part (except Kathmandu Valley) of the country. The Working area of this division includes Bara, Parsa, Makwanpur, Chitwan and Tanahun Districts. It has been operating 8 Substations namely Bharatpur, Hetauda, Kamane, Amlekhgunj, Simara, Pathlaiya, New Parwanipur and Birgunj. The 132 kV double circuit transmission lines under this division includes the line from East Bakaiya River of Bara District - Pathlaiya - Kamane - Hetauda Sections. Similarly 132 kV double circuit sections from Pathlaiya - New Parwanipur and line from Markhu dam - Kulekhani 2 - Hetauda Sections and single circuit Hetauda - Bharatpur - Marshyangdi sections are also under this division. The 66kV double circuit transmission lines under this division includes the line from Markhu dam - Kulekhani 1 - Hetauda - New Parwanipur - Birgunj sections.

Butwal Grid Division

Butwal Grid Division is located at Province No. 5 Lumbini zone, Yogikuti of Rupandehi district. This division is responsible for Operation and Maintenance of 6 Substations namely Butwal, Bardghat, Chanauta, Lamahi, Kawasoti and Ghorahi along with 132 kV voltage transmission lines that includes 132 kV single circuit Bharatpur - Kawasoti - Bardghat and Bardghat - Gandak section, double circuit Lamahi – Ghorahi, Kaligandaki - Butwal and Bardghat - Butwal - Chanauta - Lamahi - Emiliya (Dang) section.

Attaria Grid Branch

Attaria Grid Branch has its office located at Attaria chowk, Dhangadhi Road, Godawari Municipality of Kailali district. The working area of this branch includes Dang, Banke, Bardia, Kailali, Kanchanpur, Doti, Dadeldhura, Baitadi and Darchula districts. This branch has been operating 9 Substations namely Kusum, Hapure, Kohalpur, Bhurigaun, Lamki, Pahalmanpur, Attaria, Syaule and Lalpur (Mahendranagar). The 132 kV Transmission Lines under this branch includes the line from East Shivkhola of Banke District connecting Kusum - Lamahi Substation up to west Gaddachauki connecting Lalpur - Tanakpur Powerhouse, India. Out of those transmission line Lalpur - Gaddachauki section is single circuit whereas Shivkhola - Kohalpur - Bhurigaon- Lamki – Attaria- Lalpur (Mahendranagar) section is double circuit. The other transmission line sections are Chamelia - Syaule - Attaria section and Hapure - Kusum section both operating in single circuit at present. Chamelia – Attaria Section is also under Double Circuit Stringing process.

Pokhara Grid Branch

Pokhara Grid Branch is located in Pokhara Metropolitan city Ward No 27 of Kaski District. The major responsibility of this branch is to look after the operation and maintenance of 132 kV substations and transmission lines located in the north west part of the country. The working area of this branch includes Lamjung, Tanahun, Kaski, Parbhat,

Chitwan and Syangja Districts. This branch has been operating 5 substations namely Lekhnath, Pokhara, Damauli, Syangja and Markichowk. The 132 kV transmission lines under this branch includes the line from Modi Khola - Pokhara - Lekhnath - Damauli - Bharatpur section, Kaligandaki - Lekhnath section in Single Circuit and Middle Marsyangdi- Markichowk - Marsyangdi section in Double Circuit.

Dhalkebar Grid Branch

Dhalkebar Grid Branch has its office located at Dhalkebar, Mithila Municipality of Dhanusha district. The working area of this branch includes Bara, Rautahat, Sarlahi, Mahottari, Dhanusha, Siraha, Saptari, Sindhuli & Ramechap districts. This branch has been operating 5 Substations namely Chandranigahpur, Dhalkebar, Mirchaiya, Lahan and Rupani. The 132 kV double circuit transmission lines includes the line from East Mahauli of Saptari district to west Nijgadh of Bara district. The 220 kV double circuit transmission line includes twin Bison conductor lines from Dhalkebar to Khimti Power House substation at Kirne of Ramechap district which is currently charged at 132 kV Voltage Level. The Dhalkebar- Muzzafarpur 400 kV transmission lines includes double circuit twin moose conductor from Sursand of India to Dhalkebar substation which is currently charged at 220 kV Voltage Level.

Duhabi Grid Branch

Duhabi Grid Branch has its office located at Duhabi, Inaruwa Road, Duhabi Municipality of Sunsari district. The working area of this branch includes Saptari, Sunsari, Morang, Jhapa, Illam and Panchthar districts. It has been operating 7 substations namely Kushaha, Duhabi, Damak, Anarmani, Godak, Thapatar and Amarpur. The 132 kV transmission lines includes the line from west Mahauli Khola of Saptari district to east Anarmani of Jhapa district. This branch also includes Kabeli Corridor 132 kV double circuit lines from Kabeli to Damak substation. This branch is also responsible for operation and maintenance work for two cross border transmission lines from Kushaha (Nepal) to Kataiya Power House Station (India).

A. Major reinforcement/upgrading works performed

This department has executed numbers of transformer reinforcement/upgrading works in various substations. Up-gradation, reactive power compensation and rehabilitation of power system equipments in the substations are being carried out to meet the increase of power demand and voltage drop problem. The existing transformers after being replaced are reused in other substations after necessary overhauling and maintenance works. Reallocations of such power transformers are a cost effective and immediate solution for load management.

Various works executed by this department have supported to reduce forced load shedding caused by inadequate substation capacity. The department has carried out and completed following major up-gradation and reinforcement works on FY 2075/76 (2018/19) are given in Annexure B.

B. Major reinforcement/upgrading works in progress

The major up-gradation & reinforcement works for substation are initiated and are under progress are tabulated and given in Annexure B.

C. Grid Connection Agreement

The Department has successfully accomplished the Grid Connection Agreement with 60 IPPs (Independent Power Producers) for 1830.65 MW capacity (55 IPPs for 1793.65 MW for Hydropower Projects and 5 IPPs for 37 MW for Solar Photo Voltaic Projects) to mitigate the future load demand.

D. Major Maintenance works

The following major maintenance works are completed in FY 2075/76.

a. Re-routing work from Tower No. 5 to 8 on Sunkoshi – Bhaktapur 66kV transmission line at Andheri in Sindhupalchowk district.

b. Re-routing work of Tower No. 204 on Hetauda –

Birgunj 66kV transmission line nearby Churiya Mai temple of Bara district.

c. Routine Maintenance works were carried out as per schedule for substations and transmission lines.

d. Breakdown maintenance works were carried out as per requirement.

e. Total of 240 relays were tested on various substations.

f. Total of 127 energy meters (95 Meters from NEA and 32 Meters from IPP) were tested.

E. Transmission Loss Status

Comparison of Transmission Line Loss of different F/Y.

S.N.	F/Y	Total Import Energy (MWh)	Total Export Energy (MWh)	Transmission Line Loss Energy (MWh)	Transmission Line Loss in Percentage
1	2070/71	4,120,153.81	3,889,823.10	230,330.71	5.59%
2	2071/72	4,394,005.17	4,193,004.03	201,001.14	4.57%
3	2072/73	3,097,302.02	2,934,259.90	163,042.12	5.26%
4	2073/74	5,552,927.57	5,275,058.79	277,868.78	5.00%
5	2074/75	6,347,849.13	5,980,995.92	366,853.21	5.78%
6	2075/76	7,005,397.48	6,700,648.12	304,749.37	4.35%

The details single line diagram (SLD) of the existing high voltage substation are presented in annexure C.

RECENTLY COMPLETED PROJECTS

Power Efficiency Project

Objective of this project was to improve the 132 kV system voltage at Lahan substation and of those 33 kV and 11 kV feeders fed from Lahan substation. The project started in F/Y 2073/074 with estimated cost of US$ 0.3 Million. The 132 kV, 20 MVAr Capacitor Bank was charged on January 2019. The project was financed by GoN.

PROJECTS UNDER EXECUTION

Grid Substation Capacity Increment Project

Objective of this project is to increase the capacity of the Grid Substations to cater the increasing load demand and to buy spare power transformers as an immediate replacement where necessary. The project was started in F/Y 2073/074 with the estimated cost of US$ 8.4 Million by GoN funding.

The main activities of the project includes replacement of 132 kV, 66 kV & 33 kV old circuit breakers with new one; installation of 33/11 kV, 16.6MVA power transformer replacing existing 7.5 MVA at Yadukuwa substation; supply and delivery of spare power transformers; installation of 132/11 kV, 22.5 MVA new power transformer bay at Bhaktapur substation and installation of 220/132 kV, 2x315 MVA auto transformer at Dhalkebar substation.

For the replacement of circuit breakers, total 18 nos. of 132 kV, 2 nos. of 66 kV and 11 nos. of 33 kV circuit breakers were supplied out of which 16 nos. of 132 kV, 1 no. of 66 kV and 11 nos. of 33 kV circuit breakers were replaced and remaining were kept as spare.

The existing 33/11 kV, 7.5 MVA power transformer at Yadukuwa substation was upgraded to 16.6 MVA on April 2019 after the supply and installation of new 16.6 MVA power transformer. This has helped to fulfill the increasing demand of that area.

Total 6 nos. of spare power transformers (132/33 kV, 2x63 MVA; 132/11 kV, 2x30 MVA and 33/11 kV, 2x16.6 MVA) were supplied, out of which 1 no. of 132/33 kV, 63 MVA power transformer was installed at Kohalpur substation, 1 no. of 132/11 kV, 30 MVA was installed at Bharatpur substation and 1 no. of 33/11 kV, 16.6 MVA power transformer was installed at Anarmani substation. 1 no. of 132/33 kV, 63 MVA power transformer is in the process to be installed at Kamane substation and 1 no. of 132/11 kV, 30 MVA is in the process to be installed at Bharatpur substation.

Similarly, the civil foundation works at Bhaktapur substation for the new 132/11 kV, 22.5 MVA transformer bay has been completed and the transformer has already arrived at site. The work is scheduled to complete within 2 months.

The 2 nos. of 220/132 kV, 315 MVA auto transformer is to be installed at Dhalkebar substation. This will help in evacuating bulk power import from India and also to export power to India. The civil foundation work and construction of 220/132 kV transformer bays are under progress. Similarly, the transformer final acceptance test has been completed and is ready for dispatch. The work is expected to complete within 4 months.

EMERGENCY RESTORATION SYSTEMS (ERS)

Failures and damages to transmission towers are always unplanned. Failures may occur due to Landslides, high wind loading, storm damage, rock slides, mud slides, erosion of foundations, river cutting, vandalism or sabotage. Total monetary and other losses resulting from an extended outage of a key transmission line may be huge and further it is site specific. The total losses may be more than just the direct losses of the utility, especially if the utility is answerable to customers and government entities.

A few of the utility's direct losses are; cost of restoration, higher grid losses on alternate transmission lines, contractual penalties for non-availability of the transmission line, possible higher generation cost or costs for power plant reductions or shut downs. All these situations demand some quick, easy and reliable restoration system and Emergency Restoration System (ERS) may play this role and many more than this.

Realizing the need of ERS system for rapidly growing NEA Grid Network, NEA called a tender to procure this through Tender Number ERS/NCB- 073/074 -01in F/Y 2073/74. Going through each procedure of tender, ERS consignment was delivered in July 2018 with cost of around US$ 1.2 million. The ERS package contains 6-suspension towers and 4-angle towers. Including 9 (nine) officials, few work force were also provided with design and erection training at Piluwa substation, Nepal, where all ERS consignment has been stored.

A) Use of ERS at Betrawati Trishuli (Case study-I)

After procurement of ERS system, NEA decided to use ERS at Betrawati, Trishuli for the first time. This was to bypass 66 kV transmission line from Chilime Hydroelectric Power Plant, so that 220 kV transmission line for Upper Trishuli 3A Hydroelectric Power Project can be constructed without long power

Foundation Setting Work for ERS Tower

If the shutdown of about 3 weeks would have been provided,
Total shutdown period in hours = 3-weeks x 7-days x 24-hours = 504 hours
Power transmitted through Chilime-Trishuli 66 kV Line = 14 MW (Approx)
Total loss of units = 14x504 = 7056 MWh
Total cost at the rate of NRs. 8.17 per kWh = 7056 x 1000 x 8.17 = NRs. 5,76,47,520.00
In case of ERS, Total shut down period = 36 hours
Total cost in this period = 36 x 14 x 1000 x 8.17 = NRs. 41,17,680.00
Net saving due to use of ERS = NRs. 5,35,29,840.00

ERS Tower just after Completion

interruption/ shut down causing huge loss. The work was in pending as large shutdown of about 3 weeks has been demanded but using 2-ERS towers, problem was solved with shutdown of about 36 hours saving NRs. 5,35,29,840.00.

B) Use of ERS at Parsa, Birgunj (Case study-II)

Due to Tornado of 31 March, 2019 (2075-12-17), TN-60 of Parwanipur-Raksaul 132 kV transmission line was completely collapsed interrupting power import from India. The team moved to site the next day and performing all design and installation work of ERS, the line was restored after 8 days (2075-12-25) in spite of rain and wind disturbing continuously.

If ERS tower were not used urgently, it would result in power interruption in that area due to shortage of 4,55,00,000.00 kWh of energy.

C) Use of ERS at Ropani Substation, Saptari (Case study-III)

Equipment foundation erection work at Rupani substation was in pending since long due to shutdown problem of RTC transmission line from Dhalkebar to Inaruwa. Shutdown of about 2 weeks was demanded, which was not possible due to take or pay agreement of power coming from India in

Full View of Collapsed Tower

this line.2 set of ERS (51 meter high Angle tower and 35 m high suspension tower) was designed and installed at first and second week of Baisakh,

Approximate time required for complete erection of 132 kV Lattice Tower = 60 days
Average energy transmitted through this line per day in the month of Chaitra = 8,75,000 kWh
Average energy that could be transmitted in 60 days = 8,75,000 x 60 = 5,25,00,000 kWh
Applicable tariff in Raxaul-Parwanipur 132 kV Line = IRs. 6.17 per kWh
Total cost in IRs. = 5,25,00,000 x 6.17 = IRs. 32,39,25,000.00
Total cost in NRs. = 32,39,25,000.00 x 1.6 = 51,82,80,000.00
In case of ERS, Total shut down period = 8 days
Total cost in this period = 8 x 8,75,000 x 6.17 x 1.6 = NRs. 6,91,04,000.00
Total transportation and installation cost of ERS tower = NRs. 25,00,000.00 (Approx)
Net energy supplied using ERS = 5,25,00,000.00 – 8 x 8,75,000 = 4,55,00,000.00 kWh
Which is approximately = 4,55,00,000 x 6.17 x 1.6 = NRs. 44,91,76,000.00

ERS Tower After Completion

2076. The shutdown used for ERS erection was about 8 hours daily during off peak time for 3 days, which reduced the huge spilling of power. After ERS erection, substation was charged soon by finishing remaining works.

D) Future of ERS Tower Use in Nepal

Each year, we encounter damaging of transmission towers across the country due to many reasons and in some cases we are facing long supply shutdown up to weeks. If spare tower of required type and design is available, restoration could be earlier but often this may not be the case. Restoration with spare tower in many cases may demand foundation construction and prior to foundation, land acquisition in some cases. Though restoration by stringing through trees in jungle have been seen in Nepal, it is quite unsafe. As transmission network is increasing in Nepal, failure events will surely increase and may give rise to several month restoration time. In such cases, ERS tower could be the solution as there is no need of foundation work and permanent land acquisition work.

ADMINISTRATION DIVISION

Administration Division is responsible for planning, organizing, directing and controlling of policies related to human resource management under Directorate which consists of job analysis, placement, transfer, training and development, staff welfare, disciplinary actions etc. As of now, 652 employee are working out of 780 approved positions. The details of employees working under Directorate and its offices are as presented in annexure of this report.

FINANCE DIVISION

Finance Division is responsible for carrying out overall financial and accounting functions of Transmission Directorate with key responsibility areas including revenue administration, accounting operation, budgetary control and treasury management. This division is also responsible for financial planning, control and monitoring of the various departments/ projects under the directorate.

This F/Y 2075/76 remained another successful year for Transmission Directorate in terms of expenditure in the projects. This year expenditure is around 75.01% in compared to allocated budget which was 28.63% in the last fiscal year.

Fiscal Year	Approved Budget in thousand, NRs	Expenditure in thousand, NRs	% of Expenditure
2073/74	9,037,000	4,234,036	46.85
2074/75	15,863,650	4,541,787	28.63
2075/76	14,787,896	11,091,739	75.01

This was made possible by efficient management of projects as well as frequent monitoring of the projects by NEA management.

The gross income in Transmission Directorate in F/Y 2075/76 from various sources including surcharge income, sale of tender form and other items, access rental (including OPGW) and other miscellaneous sources is NRs. 34,75,88,322.08. After total deductible amount of NRs. 3,51,73,698.67 payable in the form of tax and interest, the net income is NRs. 31,24,14,623.41. In the same way, the gross income in F/Y 2074/75 was NRs. 32,19,08,367.34 and net income was 29,04,87,236.68 after deduction of tax and interest (NRs. 3,14,21,130.66). This clearly shows that in F/Y 2075/76, net income is increased by NRs. 2,19,27,386.73 which is about 7.55% more than that of F/Y 2074/75.

PROJECT MANAGEMENT DIRECTORATE (PMD)

Project Management Directorate (PMD) in the Nepal Electricity Authority organogram has a role to execute and facilitate the projects funded by Asian Development Bank. PMD is responsible for project preparation, procurement and construction of all new and existing projects that is or will be funded by ADB. In addition to execution of SASEC- Power System Expansion Project and PTDEEP (Power Transmission and Distribution Efficiency Enhancement Project), PMD is coordinating, monitoring and reporting the implementation of the projects that are being run under Energy Access and Efficiency Improvement Project (ADB Loan 2587, Grant 0182 and Grant 0183) and Electricity Transmission Expansion and Supply Improvement Project (ADB Loan 2808, Grant 0270 and Grant 0271) and Project Preparatory Facility for Energy (PPFE). PMD is now preparing procurement of sub-projects under Power Transmission and Distribution System Strengthening Project (PTDSSP) which is going to be financed by ADB as indicated in their Country Business Operation Plan of 2019.

PMD is implementing both the Transmission and Distribution Projects. It has also been engaged in introducing modern technology in NEA like Grid Substation Automation System, Smart Metering, Distribution System Undergrounding and Distribution System Automation. Number of Transmission Lines and Substations of different voltage range from 132 kV to 400 kV are under construction and many 400 kV lines and associated Substations are under study. PMD has also played a vital role in Distribution Sector with the construction of 33/11 kV SS, 33 kV Line, 11 kV Line and 400 Volt line in most needy and strategic places which has helped NEA to connect more consumers, reduce loss and increase the supply reliability.

PMD engagement includes the following major works in Transmission sector:

1. Engineering and Environmental Study of 1920 circuit km of 400 kV transmission line, 150 circuit km 220 kV transmission line and 290 circuit km of 132 kV transmission lines and associated substations.

2. Preparation of bidding documents for design, supply, construction and installation of 64 circuit km of 132 kV transmission line (including 24 circuit km of underground transmission line), 4 circuit km of 66 kV underground transmission line and a 132/66 kV, 132/33 kV, 132/11 kV substation all totaling a capacity of 551 MVA.

3. Construction of 180 circuit km of 400 kV transmission line, 688 circuit km of 220 kV TL and 80 circuit km of 132 kV transmission line is ongoing.

4. Construction of 3 nos. of 400/220 kV substation totaling a capacity of 1265 MVA, 11 nos. of 220/132 kV substation with the total capacity

of 1840 MVA, 1 nos. of 132/33 kV, 60 MVA SS and 3 nos. of 132/11 kV SS with the total capacity of 480 MVA, is ongoing.

5. PMD has already completed the construction and upgradation of 357.4 MVA capacity of 132 kV SS.

PMD has been working continuously to adopt modern technology in transmission and distribution system. It has initiated automation of grid substation in Kathmandu valley eventually leading to automation of substation all around the country. PMD is also planning to use Drone in Transmission Line stringing, Transmission Line maintenance and in surveying works.

In fiscal year 2076/77, PMD has targeted to complete following transmission line and substations:

1. 39.8 km of 220 kV double circuit transmission lines from Dana to Kushma
2. 82 km of 220 kV double circuit transmission lines from Marsyangdi to Kathmandu
3. 26 km Samundratar-Trishuli 132 kV double circuit transmission line
4. 220/132 kV, 320 MVA substation at Matatirtha
5. 220/132 kV, 160 MVA substation at Markichowk
6. 220/132 kV, 100 MVA New Butwal substation
7. 220/132 kV, 100 MVA Kushma Substation
8. 220 kV Dana Substation (220/132 kV, 100 MVA+132/33 kV, 25 MVA)
9. 132/33 kV, 60 MVA Samundratar Substation

PROJECTS UNDER CONSTRUCTION

1. Tamakoshi- Kathmandu 220/400 kV Transmission Line Project

This is one of the sub-projects recently undertaken and being executed by PMD under Loan No. 2808 - NEP: Electricity Transmission Expansion and System Improvement Project (ETESIP). The objective of this project is to evacuate power from generating stations upcoming in the Khimti (Tamakoshi) and Barhabise area. This project includes three sub-projects viz. i) New Khimti- Barhabise 400 kV DC Transmission Line of length 46 km ii) Barhabise-Kathmandu 400 kV DC Transmission Line of length 44 km & Lapsiphedi-Duwakot 132 kV DC Transmission Line of length 14 km and iii) Barhabise GIS substation (220/132 kV, 160 MVA (3x53.33 MVA) & 132/11 kV 5 MVA). Due to inadequate fund in ETESIP, one of the subprojects "220 kV GIS Substation Construction in Barhabise" has been financed through Loan No. 3542 - NEP (SF): Power Transmission and Distribution Efficiency Enhancement Project. Cumulative physical progress of 26.66% has been achieved till date.

The contract for construction of Barhabise-Kathmandu 400 kV and 132 kV Lapsiphedi-Barhabise Transmission Line has been awarded to M/s Larsen and Toubro Limited, India. Till date, tower design and testing has been completed for both 132 kV and 400 kV TL section. More than 50% of TL materials have been supplied. Out of 125 nos. of towers of 400 kV TL, 11 tower foundations have been completed and 7 are under construction. The 400 kV and 132 kV TL is scheduled to be completed by April 2020.

The contract for procurement of plant for 220 kV Barhabise GIS SS has been awarded to M/s JV of Guangxi Transmission & Substation Construction Co. and Shenzhen Clou Electronics Co. Ltd, China. Land acquisition, compensation distribution and ownership transfer has been completed. Construction work has been initiated at the substation site. Major equipment of the SS like Transformer and GIS are in the stage of manufacturing and planned to be delivered at site before December 2019.

The project office has recently signed Contract Agreement with M/s KEC International Limited, India for construction of New Khimti- Barhabise 400 kV Transmission Line after termination of contract with previous contractor due to non-performance.

Previously, detail survey and tree enumeration had been completed.

2. Samundratar- Trishuli 3B 132kV Transmission Line

The objective of this project is the construction of 26 km double circuit 132 kV transmission line (including 3 km of four circuits) from Samundratar to Trishuli 3B Hub and new 132/33 kV, 2x30 MVA & 33/11 kV, 2x8 MVA Substation at Samundratar, Nuwakot. In coordination with ADB, the project financing agreement was concluded in April 20, 2015 with European Investment Bank (EIB) to finance Loan of US$ 12.0 Million.

For transmission line part, detail survey, land acquisition, tower design and tower testing of type DA, DB, DC and DD type has been completed. 49 out of 84 nos. of tower foundation has been completed till date. Similarly, for substation part, design of electrical and civil components of substation has been approved. Equipment are being delivered to the substation site. 132/33 kV transformers have

been installed while civil works for other equipment's foundation, boundary wall, store building, staff quarter, control building, gantry structure, 33/11 kV transformer's foundation at the site is underway with the target to commission the transmission and substation facilities within FY 2076/77. The project has achieved physical progress of 60% till date.

3. Marsyangdi Corridor 220 Transmission Line Project

Marsyangdi Corridor 220 kV Transmission Line Project once completed will evacuate approximately 1600 MW of power generated by various hydropower stations in the Marsyangdi basin/ Marsyangdi River corridor. The Project comprises of construction of approx. 113 km long Double Circuit 220 kV Transmission Line from Manang (Dharapani) to Chitwan (New Bharatpur) and associated substations at Dharapani, Manang (220/132 kV, 100 MVA & 132/33 kV, 30 MVA), Khudi, Lamjung (220/132 kV, 160 MVA & 132/33 kV , 50 MVA), Udipur, Lamjung (220/132 kV, 160 MVA & 132/33 kV , 50 MVA) and New Bharatpur, Chitwan (220/132 kV 320 MVA). The length of upper section of 220 kV, double circuit transmission line from Dharapani to Udipur is 46 km. Similarly, the length of lower section of 220 kV, double circuit transmission line with twin HTLS Drake conductor from Udipur to Bharatpur is 67 km.

The contract of transmission line from Udipur to Bharatpur section has been awarded to Pinggao Group Co. Ltd, China and construction work is in progress. Tower design has been completed and testing of DB type tower has successfully completed. The tower foundation work has been started from Lamjung District.

The contract for Udipur and Bharatpur 220/132/33 kV substation was awarded to M/S Shenzen Farad Electric Co. Ltd. China. However, due to the inability of the contractor to submit performance security within given time frame, the contract has been cancelled and bids were re-invited on 15 April 2019. Technical Bids are under evaluation and contract is expected to be awarded by the end of October 2019.

Similarly, Technical Bid Evaluation Report for Dharapani (Manang) - Khudi (Lamjung) –Udipur (Lamjung) 220 kV Transmission Line and 220 kV SS at Khudi and Dharapani (Manang) has been submitted to EIB for concurrence. The contract for

this package is planned to be awarded by the end of September 2019.

Estimated total project cost is US$ 90 million and is funded by European Investment Bank. Both the sections of transmission lines and associated substations of the Project are expected to be commissioned by end of FY 2078/079 (2020/021).

The overall progress of the project till date is 12.89%.

4. Marsyangdi-Kathmandu 220 kV Transmission Line Project

The objective of this project is to transfer power from Marsyangdi corridor to Kathmandu Valley which ultimately reinforces INPS and improves reliability of transmission system. The scope of project includes construction 82 km double circuit 220 kV transmission line from Markichowk (Marsyangdi) to Kathmandu with twin "MOOSE" ACSR conductor in each phase and construction of 220/132 kV substations of capacity 160 MVA at Markichowk, Marsyangdi and 320 MVA (2x160 MVA) Matatirtha (Kathmandu). The substation in Matatirtha will be of Air Insulated (AIS) type while in Marsyangdi, the substation shall be of Gas Insulated (GIS) type. The contract agreement for transmission line was concluded on June 2016 with Tata Projects Ltd., India. Similarly, the contract agreement for substations was concluded on December 2017 with Shenzhen Farad Electric Co. Ltd., China.

Out of 231 towers, foundations of 220 towers and erection of 185 towers has been completed. Further, 42.35 km of double circuit conductor has been strung. This line is planned to be commissioned by the end of December 2019.

For substation part, almost all design and drawings of civil and electrical works has been approved. Major equipment such as power transformer, CT, PT, CVT & LA have been supplied to site at Matatirtha and Marsyangdi. Construction of boundary wall, retaining wall, gantry foundation, transformer foundation and firewall is being carried out at Matatirtha.SS. Similarly, gantry foundation, transformer foundation, firewall, quarter buildings and transit camps are ongoing at Markichowk SS.

Overall, 77.82% of work has been completed till date.

5. Kaligandaki Corridor 220kV Transmission Line Project

The scope of the project is to construct three nos. of 220/132 kV, 100 MVA Substations at Dana (Myagdi), Kushma (Parbat) and New Butwal (Bhumahi, Nawalparasi) and their interlinking 148 km, 220 kV D/C transmission lines (Dana - Kushma - New Butwal - Bardaghat).

Dana to Kushma T/L, Dana SS and Kushma SS are being constructed by the JV Contractor M/S Tata projects Limited India and CHINT electric Co. Limited, China. Out of 110 towers, 101 tower foundations & 90 tower structure erection has been completed. Out of 39.8 km of 220 kV Double Circuit Line, 15.83 km has been strung between Dana and Kushma. Both Dana – Kushma 220 kV transmission line and 220/132 kV SS at Dana and Kushma is planned to be commissioned by December 2019.

The contract for design, supply and construction of 88 km long, 220 kV D/C Transmission line from Kushma to New Butwal has been awarded to M/S Larsen & Toubro Limited, India. Tower design, testing and detail survey has been completed. The completion of check survey and cadastral survey are in final stages. Testing of conductor and hardware fittings are at different stages. Land parceling for Palpa and Syangja district for acquisition of land for tower foundation has been submitted. 25 out of 253 nos. of tower foundation have been completed and 4 are under progress. This line is planned to be commissioned in December 2020.

The contract of 220/132 kV, 100 MVA substation construction in New Butwal (Nawalparasi) has been awarded to M/s Tata projects Limited, India. Survey and soil investigation of the substation has been completed. Electrical and civil drawing design

is ongoing and is in the stage of completion. Primary equipment such as earthing materials, foundation bolts, circuit breaker, isolators are being supplied while transformer is being manufactured. Civil work such as gantry tower foundation, transformer foundation, control building, boundary wall, transit camp foundation and B, C and D type quarter building is underway. This substation is planned to be operated by December 2019.

Remaining portion of the Kaligandaki Corridor Transmission Line Project is to construct 21 km of 220 kV DC Line from New Butwal to Bardaghat. Bid evaluation is underway and scheduled to award contract by the end of October 2019. EIA of TL is in advance stage of approval.

The physical progress of this project is 51.81%.

6. Grid Substation Reinforcement and Capacity Expansion Project

The major objective of this project is to reinforce & upgrade eight numbers of existing grid substations of NEA which includes reinforcement and upgradation of 132 kV Gandak S/S, Butwal S/S, Bharatpur S/S, Kawasoti S/S, Damauli S/S, Banepa S/S, Dhalkebar S/S and Lahan S/S. Reinforcement and upgradation work of all these eight grid substation was completed on December 2017 which added substation capacity by total 280 MVA. Protection upgradation and addition of Substation Automation System in Gandak SS and Baneswar SS were also concluded successfully.

7. Lapsephedi and Changunarayan Substation Construction Project

220/132 kV, 160 MVA and 132/11 kV, 5 MVA capacity GIS SS is being constructed at Lapsephedi and 132/11 kV, 45 MVA SS will be constructed at Changunarayan. These substations will play major role to evacuate the power generated by IPPs and Upper Tamakoshi Hydro Electric Plant through Khimti–Barhabise–Kathmandu 400/220 kV Line. The contract for this package has been awarded to Sinosteel MECC-Zhaowei J/V and design works of the substations are underway while survey and geotechnical investigations are completed. The initial project completion period was scheduled on November 2019 but due to some unavoidable reasons, completion period seems to be extended. A cumulative physical progress of 26.59% has been achieved till date.

8. Kathmandu Valley Transmission Capacity Reinforcement Project

The primary focus of the project is to augment Grid substation capacity by adding three new 132/11 kV substations, 2x45 MVA each at Mulpani, Futung and Chapagaon. The project will enhance transmission substation capacity and improve reliability and quality of electricity supply in Kathmandu Valley by reducing distribution system overload. The Contract of these Substations is being executed by M/s Pinggao Group Co. Limited, China. Due to the geological and social problems, contract completion period required to be extended beyond the targeted completion period.

Progress achieved till date is 25.46%.

9. Kathmandu Valley Substation Automation Project

PMD has strongly felt the need of automation of existing grid SS to have efficient, reliable and automatic operation of grid system. This will be a move of NEA towards modernization of NEA grid system. PMD has prepared a project for automation of existing grid SS. Under this project all thirteen (13) NEA grid SS within Kathmandu Grid Division will be fully automated and be operated remotely from Control Centre located at Baneshwor S/S. This project is very important for NEA in the sense of reduction of ongoing operational cost, improvement of grid reliability, lengthening the life of equipment and improvement of organizational effectiveness. The Bid for this project is under evaluation and the Contract is expected to be awarded by the end of September 2019.

10. Hetauda-Parwanipur 132 kV DC Line Upgradation and Construction of 132 kV Parwanipur-Pokhariya TL and 132 kV Substation at Pokhariya

This project basically consists of Parwanipur-Pokhariya 132 kV Transmission Line along with the 132 kV substation Pokhariya (Parsa district) to meet the present demand of industrial growth. In future, construction of Nijgadh-Pokhariya 400 kV Transmission Line along with the concomitant substations in Nijgadh and Pokhariya has also been planned.

Proposed 132 kV Transmission line from Parwanipur to Pokhariya will be of 20 km in length and 132 kV Double circuit line will be constructed using HTLS conductor. The study of the line is being carried out by Engineering Directorate of NEA and supposed to be completed by the end of August 2019. Bids for construction of 132 kV line and 132 kV Substations at Pokahariya is planned to be invited by the end of 2019.

Likewise, considering the potentiality of cross-border line, Nijgadh-Pokhariya approximately 75 km 400 kV transmission line has been included in the Program of GoN for this fiscal year. The detailed survey and corresponding IEE are expected to be completed within the end of this fiscal year.

11. Construction of 132/11 kV substation at Thimi and Koteshwor

The main objective of this project is to reduce burden on existing Bhaktapur-Baneshwor-Patan single circuit 66 kV transmission line. The scope includes construction of a 132 kV double circuit underground cable transmission line approximately 12 km in length from existing Bhaktapur substation to newly proposed 132 kV, 90 MVA and 132/66 kV, 100 MVA GIS substaion at Koteshwor via newly proposed Thimi 132/11 kV, 90 MVA GIS substaion. This project also includes approximately 2 km 66 kV double circuit underground cable transmission line from newly proposed Koteshwor substation to existing Baneshwor substation.

Survey of the TL has been completed and Bidding Document preparation is underway.

12. Upgrading of Khimti-1, Barhabise and Lapsiphedi SS to 400 kV

The scope of the project is to upgrade (i) New Khimti SS (ii) Barhabise SS and (iii) Lapsifedi SS to 400 kV as New Khimti – Barhabise – Lapsifedi 220 kV TL is required to be charged on 400 kV in near future. With the concurrence of ADB for advance contracting, notice for IFB has been published on 21 May 2019. Capacity of New Khimti SS, Barhabise SS and Lapsifedi SS will be 630 MVA (2x3x105 MVA), 320 MVA (2x3x53.33 MVA) and 315 MVA (3x105 MVA) respectively.

PROJECTS UNDER PLANNED AND PROPOSED

Engineering and Environmental study of Transmission Lines and associated Substations under ADB Grant no. 0361 (Project Preparatory Facility for Energy (PPEE))

The prime objective of the services under PPFE is to procure a project preparation support consulting

service from consulting firms. The consulting firm is to prepare Detail Project Report including detail transmission and substation design with tower spotting and demarcation in site, safeguard studies, preparation of cost estimate and preparation of bidding documents in detail enough to provide adequate information & data to ensure that the project will be ready for procurement and construction immediately after the completion of intended project preparation support consulting service. Engineering and Environmental study of following transmission line and the associated substaion are underway.

1. New Butwal Kohalpur, Surkhet and Upper Karnali 400 kV Transmission Line project

As a part of development of East – West 400 kV trunk line, PMD is proud to be associated with the development of 400 kV Line and Substation in western part of the country i.e. from Butwal to Attariya with the ADB grant assistance under Project preparatory Facility for Energy. ELC Electro consult S.P.A, Italy has been awarded the job of detail engineering and complete design of 400 kV TL and associated substations along the route. As of now, the consultant has presented inception report. The detail study on due diligence related activities and engineering design is targeted to be completed by October 2019. The proposed Transmission route and Substation under the scope of detail study and engineering design are as follows:

Transmission Lines

- New Butwal - Lamahi 400 kV DC Transmission Line (150 km);
- Lamahi – New Kohalpur 400 kV DC Transmission Line (90 km);
- New Kohalpur – Dododhara (New Lumki) 400 kV DC Transmission Line (95 km)
- Chhinchu - Surkhet 132 kV DC Transmission Line (25 km);
- Dododhara (New Lumki) – New Attariya 400 kV DC Transmission Line (90 km)

Substations

- New Butwal 400 kV Substation;
- Lamahi 400 kV Substation;
- Dododhara (New Lumki) 400 kV Substation;
- Surkhet 132 kV Substation;
- New Attariya 400 kV Substation;
- New Kohalpur 400 kV Substation.

2. Other Transmission Line and associated Substations

NEA has initiated the detail engineering design and environmental study of three (3) different 400 kV transmission lines and two (2) 132 kV transmission lines and associated substations. Consultant recruitment are under process, and are being done in three (3) separate packages, CP-1, CP-2 and CP-3. For all three packages shortlisting of consulting firm has been concluded and RFP evaluation is underway. The details of Line and substation under each consulting packaes are as follow:

Consulting Package (CP-1)

(i) Tingla Hub - Likhu Hub - New Khimti 400 kV Double Circuit Transmission Line (approximately 55 km) and associated substation at Likhu Hub and bay expansion works at Tingla Hub Substation and New Khimti Substation.

(ii) New Khimti -Tamakoshi 3 - Sunkoshi Hub - Dhalkebar 400 kV Double Circuit Transmission Line (approximately 110 km) and associated substation at Sunkoshi Hub and bay expansion at Dhalkebar Substation.

Consulting Package (CP-2)

(i) The 400 kV Double circuit Budhigandaki Corridor (Philim- Gumda- Ratamate) (approximately 95 km) transmission line and

associated 400 kV substations at Philim/ Gumda (Gorkha District) and Ratamate (Nuwakot District).

(ii) 132 kV Double circuit Dailekh - Kalikot – Jumla (approx. 80 km) and associated substations at Jumla and Kalikot and bay extension work at Dailekh substation

(iii) 132 kV Double circuit Lamoshangu – Kavre/ Ramechap (approx. 40 km) transmission line and associated Substations at the bordering area of Kavre/Ramechhap and associated bay extension work at Lamosanghu Substation.

Consulting Package (CP-3)

400 kV Double circuit Damauli - Kusma - Burtibang - Bafikot (approximately 200 km) transmission line and associated 400 kV substations at Kusma, Burtibang and Bafikot and bay extension at Damauli Hub substation

The study of all the above transmission and Substation is planned to be completed within 12 months.

3. Kathmandu Valley 220 kV Ring Main Project

This project has been formulated to meet the demand of Kathmandu valley. This project comprises the construction of 75 km 220 kV double circuit line on monopole along the proposed outer ring road being developed by Kathmandu Valley Development Authority. Total three numbers of 220/132 kV SS of 400 MVA each and 132/11 kV SS of 90 MVA each at Kathmandu, Bhaktapur and Lalitpur districts are proposed. Due to rapid urbanization in Kathmandu valley, land acquisition for TL and SS construction is being very tough, as such using monopole for TL along the outer ring road and initiating construction along with is the best opportunity for NEA. Estimated cost of the project is USD 150 Million. This project is required to implement along with the outer ring road project of the GoN and the GoN is reviewing the DPR. As soon as the DPR of outer ring road finalizes, the procurement of proposed 220 kV Ring main Project required to be initiated.

SUMMARY OF UNDER CONSTRUCTION/ PLANED & PROPOSED TRANSMISSION LINES / SUBSTATIONS

Transmission Line

S.N.	Description	Voltage Level	Transmission Directorate	Project Management Directorate	Total
1	Under construction Transmission Line (Circuit km)	132 kV	805	144	949
		220 kV	630	688	1318
		400 kV	576	180	756
2	Planed and Proposed Transmission Line (Circuit km)	132 kV	1340	290	1630
		220 kV	220	150	370
		400 kV	1130	1920	3050

Substation

S.N.	Description	Transmission Directorate	Project Management Directorate	Total
1	Under construction Transmission Line (Circuit km)	5388	4112	9500
2	Planed and Proposed Transmission Line (Circuit km)	1616	7104	8720

Annexure A: List of Figures

Figure 1: System Load Curve, Asar 15, 2076 (June 30, 2019) - Wet

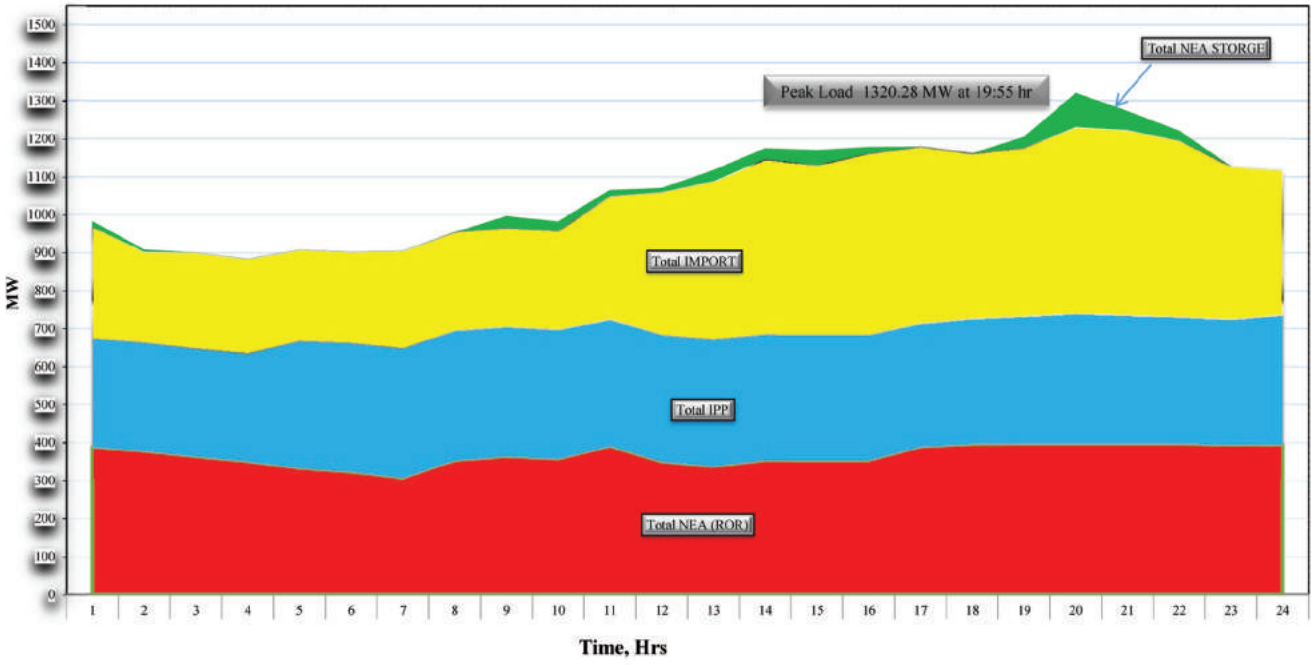


Figure 2: System Load Curve Poush 26, 2075 (January 10, 2019) (Dry)

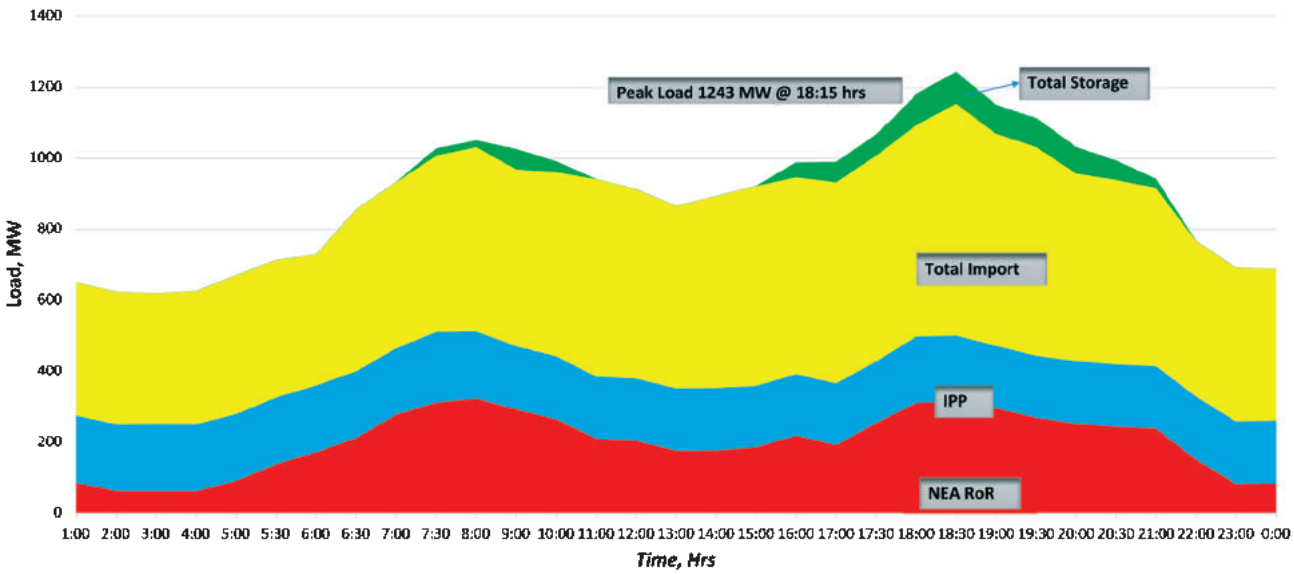


Figure 3: System Load Curve, Sharwan 4, 2076 (July 20, 2019) -Wet

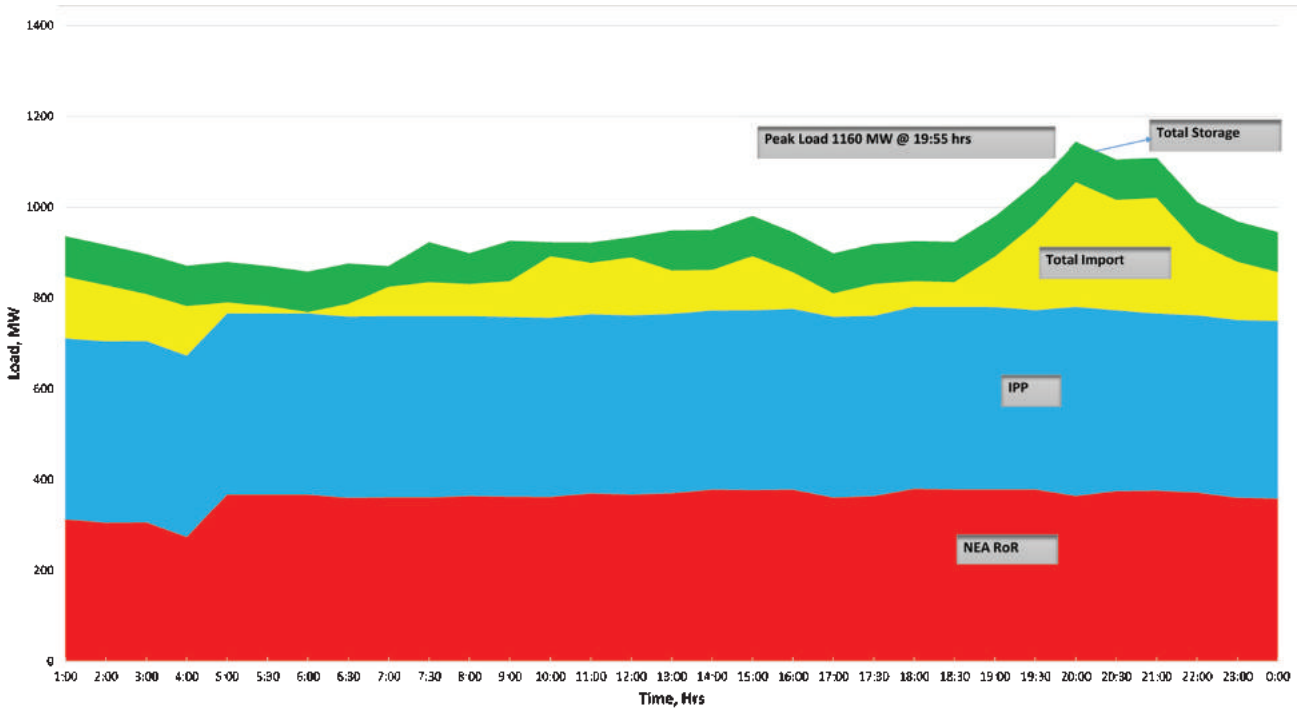
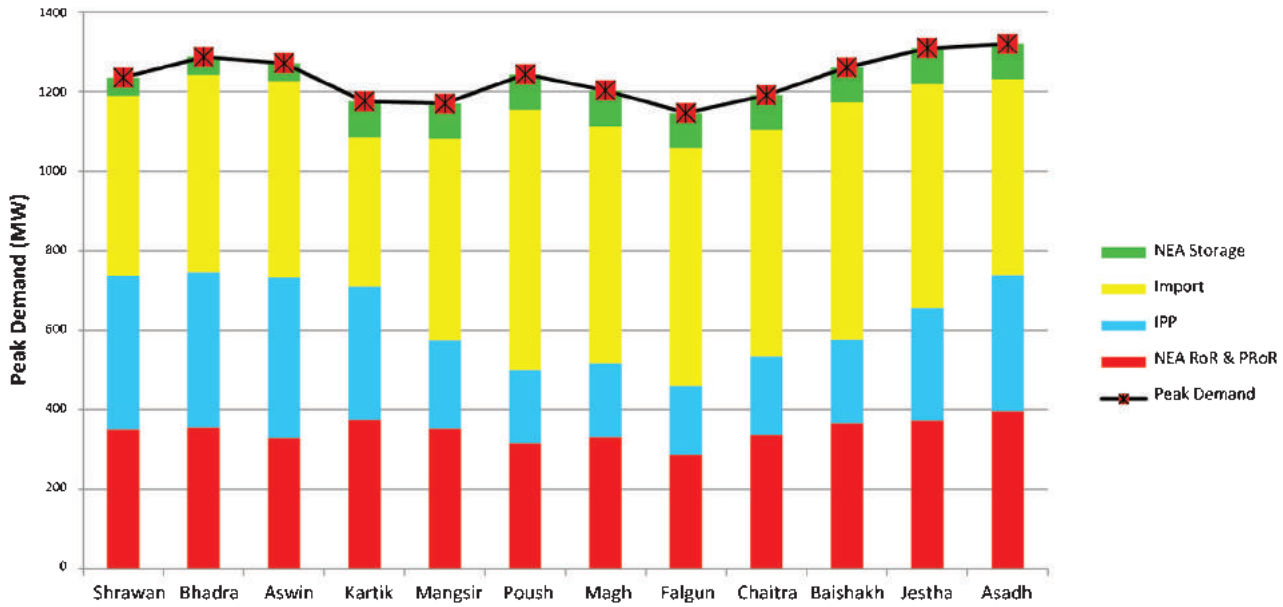
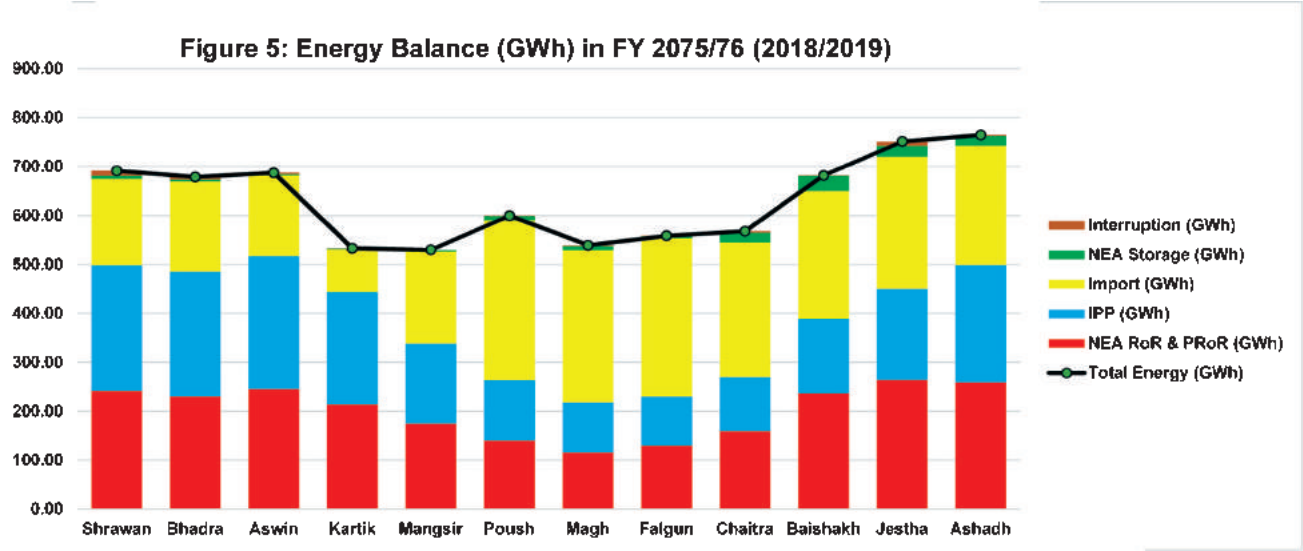


Figure 4: Capacity Balance (MW) in FY 2075/76 (2018/2019)



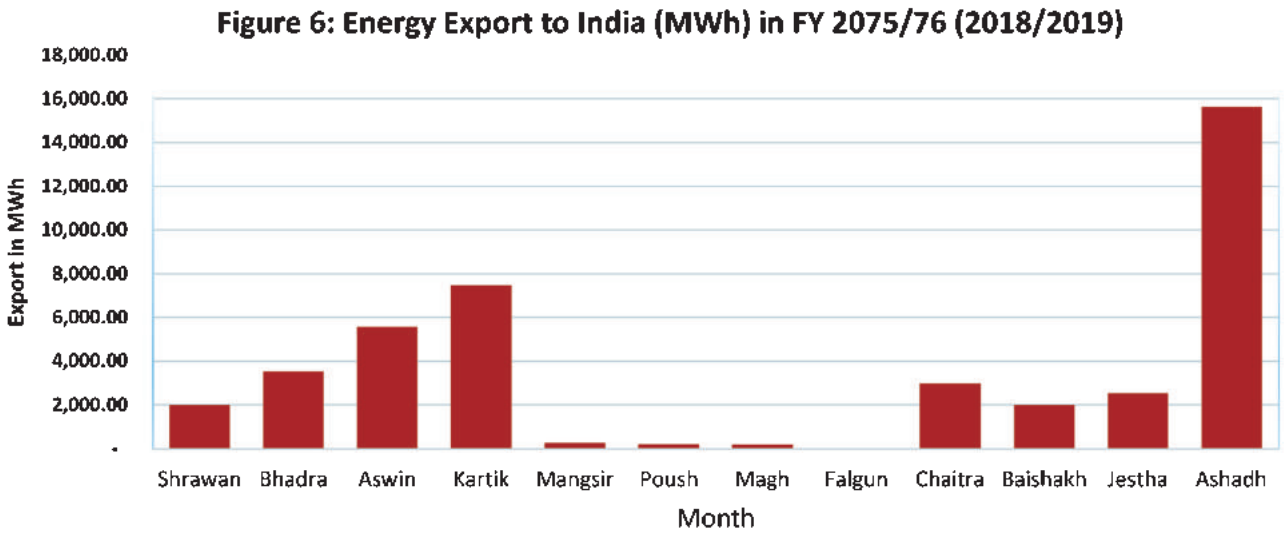
Monthly Peak Demand (MW)

Month	Shrawan	Bhadra	Aswin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Asadh
Import (MW)	450.86	494.91	493.2	374.77	506.05	653.47	596.39	596.06	570.3	596.1	562.45	491.12
IPP (MW)	388.01	391.81	403.2	334.85	222.24	184.4	184.46	174.32	196.08	211.27	282.96	343.46
NEA RoR & PRoR (MW)	350.89	355.44	329.74	375.75	353.3	316.3	332.35	286.9	338.2	365.95	374.1	396.4
NEA Storage (MW)	45.5	45	45.1	90.4	89	89.4	89.6	89	86.7	87.7	90	89.3
Peak Demand (MW)	1235.26	1287.16	1271.24	1175.77	1170.59	1243.57	1202.8	1146.28	1191.28	1261.02	1309.51	1320.28



Monthly Energy Balance (GWh) in FY 2075/76 (2018/2019)

Month	Shrawan	Bhadra	Aswin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Ashadh	Total
NEA RoR & PRoR (GWh)	241.84	230.64	245.16	214.49	175.24	140.31	115.49	130.14	160.14	237.33	264.59	259.27	2414.63
IPP (GWh)	256.63	255.33	272.43	229.31	163.31	123.47	102.46	99.78	109.79	152.15	185.95	239.50	2190.05
Import (GWh)	176.49	183.86	164.29	87.05	187.90	326.58	311.75	323.97	275.55	260.82	270.38	244.44	2813.07
NEA Storage (GWh)	6.57	4.26	3.26	2.06	3.41	8.94	8.14	4.07	19.95	30.97	22.21	19.62	133.47
Interruption (GWh)	9.94	4.85	2.26	0.23	0.00	0.30	1.41	0.68	2.59	0.70	8.06	1.69	32.70
Total Energy (GWh)	**691.47**	**678.93**	**687.39**	**533.14**	**529.84**	**599.59**	**539.25**	**558.64**	**568.01**	**681.98**	**751.19**	**764.50**	**7583.92**



Monthly Energy Export to India (MWh) in FY 2075/76 (2018/2019

Month	Shrawan	Bhadra	Aswin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Ashadh
Kataiya I (MWh)	2005.92	3541	5564.16	7467.84	290.88	214.56	184.32	40.32	1164.96	852.48	601.92	8493.12
Kataiya II (MWh)	0	0	0	0	0	0	0	0	0	0	0	3050
Ramnagar (MWh)				2.4	2.4	0	0	0	1824	1149.6	1946.4	3240
Raxaul (MWh)												861.68
Total (MWh)	2,005.92	3,541.00	5,564.16	7,470.24	293.28	214.56	184.32	40.32	2,988.96	2,002.08	2,548.32	15,644.80

Annexure B: List of Tables

Table 1: Existing high voltage transmission lines

SN	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
A	**132 kV Transmission Line**				
1	Anarmani-Duhabi	Single	75.76	BEAR	250
2	Kushaha (Nepal)-Kataiya(India)	Single	15.00	BEAR	250
3	Duhabi-Lahan-Chandranigahapur-Pathalaiya-Parwanipur/Pathalaiya-Hetauda	Double	608.00	BEAR	250
4	Hetauda-KL2 P/S	Double	16.00	BEAR	250
5	Bharatpur-Marsyangdi P/S	Single	25.00	DUCK	300
6	Hetauda-Bharatpur	Single	70.00	PANTHER	200
7	Marsyangdi P/S-Suichatar	Single	84.00	DUCK	300
8	Suichatar-Matatirtha- KL2 P/S	Double	72.00	BEAR	250
9	Suichatar-Balaju	Single	5.00	BEAR	250
10	Balaju-Chapali-New Bhaktapur	Double	36.00	BEAR	250
11	New Bhaktapur-Lamosangu	Double	96.00	BEAR	250
12	Lamosangu-Khimti P/S	Single	46.00	BEAR	250
13	Lamosangu-Bhotekoshi P/S	Single	31.00	BEAR	250
14	Bharatpur-Damauli	Single	39.00	WOLF	150
15	Bharatpur-Kawasoti-Bardghat	Single	70.00	PANTHER	200
16	Bardghat-Gandak P/S	Double	28.00	PANTHER	200
17	Bardghat-Butwal	Double	86.00	BEAR	250
18	Butwal-KGA P/S	Double	116.00	DUCK	300
19	KGA P/S-Lekhnath	Double	96.00	DUCK	300
20	Lekhnath-Damauli	Single	45.00	WOLF	150
21	Lekhnath-Pokhara	Single	7.00	DOG	100
22	Pokhara-Modikhola P/S	Single	37.00	BEAR	250
23	Butwal-Shivapur-Lamahi-Kohalpur	Double	430.00	BEAR	250
24	Lamahi-Jhimruk P/S	Single	50.00	DOG	100
25	Kohalpur-Bhurigaun-Lumki	Single	88.33	BEAR	250
26	Lamki-Pahalwanpur-Attariya-Mahendranagar (Lalpur)	Double	203.12	BEAR	250
27	Mahendranagar-Gaddachauki	Single	12.00	BEAR	250
28	Marsyangdi -M. Marsyangdi	Double	80.00	CARDINAL	420
29	Damak-Godak	Double	70.00	BEAR	250
30	Kusum-Hapure	Single	22.00	BEAR	250
31	Bhulbhule- Middle Marsyangdi P/S	Single	22.00	BEAR	250
32	Chameliya-Attaria	Double	236.00	BEAR	250
33	Raxual-Parwanipur (Cross Border-Nepal Portion)	Single	16.00	BEAR	250
34	Kusaha-Kataiya (Cross Border-Nepal Portion)	Single	13.00	BEAR	250
35	Dumre Damauli	Double	46.00	BEAR	250
36	Lamahi Ghorahi	Double	25.00	BEAR	250
37	Kushma -Lower Modi	Single	6.20	BEAR	250
38	Godak- Phidim-Amarpur (Kabeli II & III)	Double	113.13	BEAR	250
39	Trishuli 3A-Trishuli 3B Hub	Double	6.00	BISON	350
Total			**3142.54**		

SN	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
B	**400/220 kV Transmission Line**				
1	Dhalkebar-Muzzaffarpur 400 kV Cross Border Line	Double	78.00	MOOSE	500
2	Khimti- Dhalkebar 220 kV Transmission Line	Double	142.00	BISON	350
3	Trishuli 3B Hub-Matatirtha	Double	98.00	BISON	350
4	Matatirtha- Matatirtha Substation	Double Ckt, Underground	2.50	1C, XLPE Cu Cable	1200
		Double Ckt, Underground	2.50	1C, XLPE Cu Cable	1600
5	Hetauda- Bharatpur	Double	10.00	BISON	350
Total			**333.00**		
C	66 kV Transmission Line				
1	Chilime P/S-Trishuli P/S	Single	39.00	WOLF	150
2	Trisuli P/S-Balaju	Double	58.00	DOG	100
3	Trisuli P/S-Devighat P/S	Single	4.56	WOLF	150
4	Devighat P/S-Okhaltar	Double	53.00	DOG	100
5	Okhaltar-Chapali	Double	5.60	XLPE Cable	500
6	Chapali-New Chabel	Double	10.00	DOG	100
7	New Chabel-Lainchaur	Single	7.00	XLPE Cable	500
8	Balaju-Lainchor	Single	2.00	PANTHER	200
9	Balaju-Siuchatar-KL1 P/S	Double	72.00	WOLF	150
10	KL 1 P/S-Hetauda-Birgunj	Double	144.00	WOLF	150
11	Suichatar-Teku	Double	8.20	BEAR	250
12	Suichatar-New Patan	Double	13.00	WOLF	150
13	Teku-K3 (underground)	Double, Single Core	5.60	XLPE Cable	400/500
14	Bhaktapur- Baneshwor-Patan	Single	16.50	LGJ 120 /WOLF	120/150
15	Bhaktapur-Banepa-Panchkhal-Sunkoshi P/S	Single	48.00	LGJ 120	120
16	Indrawati- Panchkhal	Single	28.00	PANTHER	200
Total			**514.46**		

Table 2: Under construction high voltage transmission lines

S.N.	132 kV Transmission Line	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)	Expected Completion Year (FY)
I	Transmission Directorate					
A	132 kV Transmission Line					
1	Singati-Lamosangu	Double	80	BEAR	250	2019/20
2	Solu Corridor	Double	180	CARDINAL	420	2019/20
3	Ramechap-Garjyang-Khimti	Double	62	BEAR	250	2019/20
4	Dordi Corridor	Double	20	CARDINAL	420	2019/20
5	Bardaghat-Sardi	Double	40	BEAR	250	2019/20
6	Raxual-Parwanipur 2nd Ckt Line(Cross Border-Nepal Portion)	Single	16	BEAR	250	2019/20

S.N.	132 kV Transmission Line	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)	Expected Completion Year (FY)
7	Kusaha-Kataiya 2nd Ckt Line (Cross Border-Nepal Portion)	Single	13	BEAR	250	2019/20
8	Butwal-Lumbini	Double	40	BEAR	250	2020/21
9	Burtibang-Paudi Amarai-Tamghas-Sandhikharka-Gorunsinghe	Double	168	BEAR	250	2020/21
10	Kushaha- Biratnagar	Double	46	BEAR	250	2020/21
11	Thankot-Chapagaon	Double	56	BEAR	250	
12	New Modi-Lekhnath	Double	84	BEAR	250	2021/22
		Total	**805.0**			
B	220 kV Transmission Line					
1	Chilime-Trishuli	Double	54	BISON	350	2019/20
2	Hetauda-Bharatpur	Double	148	BISON	350	2020/21
3	Bharatpur-Bardghat	Double	148	BISON	350	2020/21
4	Koshi Corridor (Inaruwa-Basantapur-Baneshwor-Tumlingtar)	Double	210	MOOSE	500	2020/21
5	Koshi Corridor (Basantapur-Dhungesangu)	Double	70	MOOSE	500	2021/22
	Total		**630**			
C	400 kV Transmission Line					
1	Hetauda-Dhalkebar-Inaruwa	Double	576	MOOSE	500	2020/21
	Total		**576**			
II	Project Managment Directorate					
A	132 kV Transmission Line					
1	Samundratar - Trishuli	Double	52	AAAC Upas	300	2019/20
2	Lapsifedi - Changunarayan - Duwakot	Double	28	BEAR	250	2019/20
3	Parwanipur - Pokhariya **	Double	40	ACCC Amsterdam	376	2021/22
4	Bhaktapur - Thimi - Koteswar**	Double	24	Single Core XLPE	500 sq. MM Cu	2021/22
	Total		**144**			
	(Note : ** - In the process of Procurement)					
B	220 kV Transmission Line					
1	Marsyangdi - Kathmandu	Double	164	Twin Moose	500	2019/20
2	Dana - Kushma	Double	79.6	Moose	500	2019/20
3	Kushma - New Butwal	Double	176	ACCC Drake	519.7	2020/21
4	New Butwal - Bardaghat	Double	42	BISON	350	2021/22
5	Udipur - Bharatpur	Double	134	ACCC Drake	519.7	2020/21
6	Udipur - Khudi	Double	36	ACCC Drake	519.7	2021/22
7	Khudi - Manang	Double	56	Moose	500	2021/22
	Total		**688**			
C	400 kV Transmission Line					
1	New Khimti - Barhabise	Double	92	MOOSE	500	2020/21
2	Barhabise - Kathmandu	Double	88	MOOSE	500	2021/22
	Total		**180**			

Table 3: Planned and proposed high voltage transmission lines

S.N.	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
I	**Transmission Directorate**				
A	**400 kV Transmission Line**				
1	Kerung-Chilime Hub-Ratmate	Double	140.00	MOOSE	500
2	Bheri Corridor	Double	50.00	MOOSE	500
3	Arun Inaruwa Anarmani	Double	460.00	MOOSE	500
4	Arun-Dudhkoshi-Tingla	Double	230.00	MOOSE	500
5	Dudhkoshi-Dhalkebar	Double	170.00	MOOSE	500
6	New Butwal Gorakhpur	Double	80.00	MOOSE	500
	Total		**1130.00**		
B	**220 kV Transmission Line**				
1	Lapan - Ratomate	Double	52.00	MOOSE	500
2	Tumlingtal Sitalpati	Double	30.00	MOOSE	500
3	Trishuli 3B - Ratomate	Double	48.00	MOOSE	500
4	Lekhnath-Damauli	Double	90.00	MOOSE	500
	Total		**220.00**		
C	**132 kV Transmission Line**				
1	Dhalkebar-Loharpatti	Double	40.00	BEAR	250
2	Dhalkebar- Balganga	Double	48.00	BEAR	250
3	Dadakhet- Rahughat	Double	50.00	BEAR	250
4	Ghorahi-Madichaur	Double	72.00	BEAR	250
5	Borang-Lapan	Double	46.00	BEAR	250
6	Nawalpur (Lalbandi) Salimpur	Double	40.00	BEAR	250
7	Pathlaiya Harniya	Double	54.00	BEAR	250
8	Bhumahi-Hakui	Double	32.00	BEAR	250
9	Bajhang-Deepayal-Attariya	Double	260.00	BEAR	250
10	Madichaur Bafikot	Double	150.00	BEAR	250
11	Kohalpur-Surkhet-Dailekh	Double	168.00	BEAR	250
12	Kaligandaki- Ridi	Double	44.00	BEAR	250
13	Balefi Corridor	Double	40.00	BEAR	250
14	Kohalpur- Nepalgunjg	Double	40.00	BEAR	250
15	Godak -Anarmani	Double	70.00	BEAR	250
16	Kabeli (Amarpur) Dhungesangu	Double	40.00	BEAR	250
17	Inaruwa Dharan	Double	50.00	BEAR	250
18	Godak Soyak	Double	16.00	BEAR	250
19	Barhabise Lamosaghu (Sunkoshi 132 kV SS)	Double	24.00	BEAR	250
20	Mainahiya Sampatiya	Double	56.00	BEAR	250
	Total		**1340.00**		
II	**Project Management Directorate**				
A	**400 kV Transmission Line**				
1	Nijgadh - Hetaunda TL	Double	150.00	MOOSE	500
2	New Butwal-Lamahi TL	Double	300.00	MOOSE	500
3	Lamahi-New Kohalpur TL	Double	180.00	MOOSE	500
4	New Kohalpur-Dododhara TL	Double	190.00	MOOSE	500
5	Dododhara(New Lamki)-New Attariya (Daiji) TL	Double	180.00	MOOSE	500
6	Tingla Hub-Likhu Hub- New Khimti TL	Double	110.00	MOOSE	500
7	New Khimti-Tamakoshi 3-Sunkoshi Hub-Dhalkebar TL	Double	220.00	MOOSE	500

S.N.	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
8	Budhigandaki Corridor (Philim-Gumda-Ratamate) TL	Double	190.00	MOOSE	500
9	Damauli-Kusma-Burtibang-Bafikot	Double	400.00	MOOSE	500
	Total:		**1920.00**		
B	**220 kV Transmission Line**				
1	Kathmandy valley Ring Main	Double	150.00	MOOSE	500
Total			**150.00**		
C	**132 kV Transmission Line**				
1	Chhinchu - Surkhet	Double	50.00	BEAR	250
2	Dailekh - Kalikot - Jumla	Double	160.00	BEAR	250
3	Lamosangu - Kavre/Ramechhap	Double	80.00	BEAR	250
Total			**290.00**		

Table 4: Existing high voltage grid substations

S.No	Substation	Voltage Ratio kV	Capacity FY 074-75 MVA	Capacity FY 075-76 MVA
A	**Kathmandu Grid Division**			
1	Balaju	132/66	45	45
		66/11	22.5	22.5
		66/11	22.5	22.5
		66/11		22.5
2	Chapali	132/11	30	30
		132/66	49.5	49.5
		132/66	49.5	49.5
3	Siuchatar	132/66	37.8	37.8
		132/66	37.8	37.8
		132/66	37.8	37.8
		66/11	18	18
		66/11	18	18
4	New Chabel	66/11	22.5	22.5
		66/11	22.5	22.5
		66/11	22.5	22.5
5	Lainchour	66/11	22.5	22.5
		66/11	22.5	22.5
6	New Patan	66/11	18	18
		66/11	18	18
		66/11	18	18
		66/11	0	18
7	Teku	66/11	22.5	22.5
		66/11	22.5	22.5
8	K3	66/11	22.5	22.5
		66/11	22.5	22.5
9	Baneswor	66/11	18	18
		66/11	18	18
10	Bhaktapur	132/66	49.5	49.5
		132/11	22.5	22.5
		132/11	22.5	22.5
11	Banepa	66/11	22.5	22.5
		66/11	22.5	

S.No	Substation	Voltage Ratio kV	Capacity FY 074-75 MVA	Capacity FY 075-76 MVA
12	Panchkhal	66/11	10	10
13	Lamosanghu	132/33	30	30
14	Matatirtha	132/33	30	30
		132/11	22.5	22.5
15	Indrawati	66/11	7.5	10
B	**Hetauda Grid Division**			
16	Hetauda	132/66	45	45
		132/66	45	45
		66/11	10	10
		66/11	10	10
17	Kamane	132/33	30	30
		33/11	16.6	16.6
18	Bharatpur	132/33	30	30
		132/33	30	30
		132/11	15	30
		132/11	22.5	22.5
19	Birgunj	66/33	12.5	12.5
		66/33	12.5	12.5
		66/11	30	30
		66/11	30	30
20	Parwanipur	132/11	22.5	22.5
		132/11	22.5	22.5
		132/11	22.5	22.5
		132/66	63	63
		132/66	63	63
21	Simra	66/11	15	15
		66/11	15	15
22	Amlekhgunj	66/11	7.5	7.5
23	Pathlaiya	132/11	22.5	22.5
C	**Dhalkebar Grid Branch**			
24	Lahan	132/33		
		132/33	63	63
		33/11	16.6	16.6
		33/11	16.6	16.6
25	Chapur	132/33	30	30
		132/33	30	30
		33/11	8	8
26	Dhalkebar	220/132		160
		220/132		160
		132/33	30	30
		132/33	63	63
		33/11	8	8
		33/11	16.6	16.6
27	Mirchaiya	132/33	30	30
		33/11	8	16.6
28	Rupani	132/33		63

S.No	Substation	Voltage Ratio kV	Capacity FY 074-75 MVA	Capacity FY 075-76 MVA
D	**Duhabi Grid Branch**			
29	Duhabi	132/33	63	63
		132/33	63	63
		132/33	63	63
		33/11	16.6	16.6
		33/11	16.6	16.6
30	Anarmani	132/33	30	30
		132/33	30	30
		33/11	16.6	16.6
		33/11	8	16.6
31	Damak	132/33	30	30
		33/11	16.6	16.6
32	Godak	132/33	30	63
		33/11	8	8
33	Phidim	132/33		20
		33/11		3
34	Amarpur (Kabeli)	132/33		30
		33/11		3
E	**Butwal Grid Division**			
35	Butwal	132/33	63	63
		132/33	63	63
		132/33	63	63
		33/11	16.6	16.6
		33/11	16.6	16.6
		33/11	0.0	16.6
36	Bardghat	132/11	22.5	22.5
		132/11	7.5	7.5
37	Chanauta	132/33	30	30
		132/33	12.5	12.5
		33/11	3	8
		33/11	3	3
38	Lamahi	132/33	63	63
		132/33	30	30
		33/11	16.6	16.6
		33/11		
39	Ghorahi	132/33		30
40	Kawasoti	132/33	30	30
		33/11	16.6	16.6
F	**Pokhara Grid Branch**			
41	Damauli	132/33	30	30
		132/33	30	30
		33/11	16.6	16.6
		33/11	3	3
42	Pokhara	132/11	30	30
		132/11	30	30
43	Lekhnath	132/33	12.5	30
		132/11		
		132/11	22.5	22.5
44	Markichowk	132/33		30

S.No	Substation	Voltage Ratio kV	Capacity FY 074-75 MVA	Capacity FY 075-76 MVA
45	Syangja	132/33	30	30
		33/11	8	8
G	Attaria Grid Branch			
46	Kusum	132/11	12.5	12.5
47	Hapure	132/33		30
		33/11		8
48	Attaria	132/33	30.0	30.0
		132/33	30.0	30.0
		33/11	16.6	16.6
49	Kohalpur	132/33	30	63
		132/33	30	30
		33/11	3	3
		33/11	16.6	16.6
50	Lamki	132/33	15	15
		132/33	15	15
		33/11	16.6	16.6
51	Mahendranagar	132/33	15	15
		132/33	10	15
		33/11	7.5	7.5
52	Bhurigaon	132/33	30	30
		33/11	8	8
53	Pahalmanpur	132/33	30	30
		33/11	8	8
54	Syaule	132/33		30
		33/11		8

S.No	Voltage Rating (kV)	No.	Total Capacity FY 74-75 (MVA)	Total Capacity FY 75-76 (MVA)
1	220/132	2		320
2	132/66	11	522.90	522.90
3	132/33	46	1397.00	1718.50
4	132/11	16	350.00	365.00
5	66/33	2	25.00	25.00
6	66/11	29	553.50	574.00
7	33/11	33	349.1	409.9
	Total	137	3197.50	3935.30

Table 5: Under construction high voltage grid substations

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA	Expected Completion Year AD
I	Transmission Directorate					
1	Hetauda- Dhalkebar-Inaruwa 400 kV Substation Expansion Project	Dhalkebar	400/220	3 Ø, 3x315	945	2019/20
2	Chilime Trishuli 220 kV Transmission Line	Chilime	220/132 132/33	1 Ø, 7x53.33 Bank 3 Ø, 50	370	2019/20

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA	Expected Completion Year AD
3	Trishuli 3B Hub Substation	Trishuli 3 B Hub	66/11	1 Ø, 7x53.33 Bank 3 Ø, 50	370	2019/20
4	Hetauda- Bharatpur220 kV Transmission Line	New Bharatpur (Aaptari)	132/33	3 Ø, 22.5	22.5	2019/20
5	Kabeli Corridor 132 kV Transmission Line	Amarpur (Kabeli)	132/33 33/11	3 Ø, 30 3 Ø, 3	33	2019/20
6	Singati Lamosanghu 132 kV Transmission Line	Singati	132/33	3 Ø, 30	30	2019/20
7	Ramechhap Garjyang Khimti 132 kV Transmission Line	Garjyang	132/33	1 Ø, 4x10 Bank	30	2019/20
8	Kushaha Kataiya 132 kV Second Circuit Transmission Line	Kushaha	132/11	3 Ø, 22.5	22.5	2019/20
9	Solu Corridor 132 kV Transmission Line	Tingla	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2019/20
10	Dordi Corridor132 kV Transmission Line	Kritipur	132/11	3 Ø, 10	10	2019/20
11	Butwal Lumbini132 kV Transmission Line	Mainahiya	132/33 33/11	3 Ø, 2x45 3 Ø, 16	106	2019/20
12	Purbi Chitwan 132 kV Substation	Hardi	132/33	3 Ø, 2x30 3 Ø, 16.6	76.6	2019/20
13	Hetauda- Dhalkebar-Inaruwa 400 kV Substation Expansion Project	Hetauda	400/220	1 Ø, 4x167 Bank	500	2020/21
		Inaruwa	400/220	3 Ø, 3x315	945	2020/21
14	Nepal India Electricity Transmission and Trade Project (Hetauda-Dhalkebar-Inaruwa 400 kV Transmission Line)	Hetauda	220/132 132/11	3 Ø, 2x100 3 Ø, 10	210	2020/21
		Inaruwa	220/132 220/33	3 Ø, 2x100 3 Ø, 2x63	326	2020/21
15	Koshi Corridor 220 kV Transmission Line	Tumlingtar	220/132 132/33	1 Ø, 7x33.33 Bank 3 Ø, 2x30	260	2020/21
		Baneshwor	220/33	3 Ø, 2x30	60	2020/21
		Basantapur	220/132 132/33	1 Ø 7x33.33 Bank 3 Ø, 30	230	2020/21
16	Ramechhap Garjyang Khimti 132 kV Transmission Line	New Khimti	220/132	1 Ø, 4x66.67 Bank	200	2020/21

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA	Expected Completion Year AD
17	Burtibang Paudi Amarai Tamghas Sandhikharka Gorusinghe 132 kV Transmission Line	Burtibang	132/33	3 Ø, 30	30	2020/21
		Paudi Amarai	132/33	3 Ø, 30	30	2020/21
		Tamghas	132/33	3 Ø, 30	30	2020/21
		Sandhikharka	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2020/21
		Motipur	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2020/21
18	Kushaha Biratnagar 132 kV Transmission Line	Biratnagar	132/33 33/11	3 Ø, 2x63 3 Ø, 16	142	2020/21
19	Nawalpur 132 kV Substation	Nawalpur	132/33 33/11	3 Ø, 63 3 Ø, 16	79	2020/21
20	Sunwal 132 kV Substation	Sunwal	132/33 132/11	3 Ø, 2x63 3 Ø, 22.5	148.5	2020/21
21	Koshi Corridor 220 kV Transmission Line	Dhungesanghu	132/33	1 Ø, 7x5 Bank	30	2021/22
22	New Modi Lekhnath132 kV Transmission Line	Lahachowk	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2021/22
Total					**5,388.10**	
II	**Under Project Management Directorate**					
1	Marsyangdi - Kathmandu Transmission Line Project	Markichowk	220/132	1 Ø, 4x53.33	160	2019/20
		Matatirtha	220/132	1 Ø, 7x53.33	320	2019/20
2	Kaligandaki Corridor 220 kV TL Project	Dana	220/132 132/33	1 Ø, 4x33.33 Bank 3 Ø, 25	125	2019/20
		Kushma	220/132	1 Ø, 4x33.33	100	2019/20
		New Butwal	220/132	1 Ø, 4x33.33	100	2019/20
3	Samundratar - Trishuli 3B Hub 132 kV TL Project	Samundratar	132/33	3Ø, 2x30	76	2019/20
			33/11	3Ø, 2x8		
4	Marsyangdi Corridoor 220 kV TL Project	Bharatpur	220/132	3Ø, 2x160	320	2021/22
		Udipur	220/132	1 Ø, 4x53.33	210	2021/22
			132/33	3Ø, 1x50		
		Khudi	220/132	1 Ø, 4x53.33	210	2022/23
			132/33	3Ø, 1x50		
		Manang	132/33	1 Ø, 4x33.33	130	2022/23
			132/33	3Ø, 1x30		
5	Barhabise Substation Project	Barhabise	220/132	1 Ø, 4x53.33	165	2020/21
			132/11	3Ø, 1x5		
6	Lapsiphedi and Changunarayan SS Project	Lapsifedi	220/132	1 Ø, 4x53.33	165	2020/21
			132/11	3Ø, 1x5		
		Changunarayan	132/11	3Ø, 1x45	45	
7	Kathmandu Valley Transmission Capacity Reinforcement Project	Mulpani	132/11	3Ø, 2x45	90	2020/21
		Futung	132/11	3Ø, 2x45	90	2020/21
		Chapagaun	132/11	3Ø, 2x45	90	2020/21

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA	Expected Completion Year AD
8	New Khimti - Barhabise - Lapsifedi 400 kV SS Project	New Khimti	400/220	1 Ø, 7x105	630	2021/22
		Barhabise	400/220	1 Ø, 7x53.33	320	2021/22
		Lapsifedi	400/220	1 Ø, 4x105	315	2021/22
9	Parwanipur - Pokhariya 132 kv TL Project**	Pokhariya	132/33	3Ø, 2x63	171	2021/22
			132/11	3Ø, 1x45		
10	Bhatktapur - Thimi - Koteswar 132 TL Project**	Thimi	132/11	3Ø, 2x45	90	2021/22
		Koteswar	132/66	3Ø, 1x100	190	2021/22
			132/11	3Ø, 2x45		
Total					**4,112.00**	
(Note : ** - In the process of Procurement)						

Table 6: Planned and proposed high voltage grid substations

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA
I	**Transmission Directorate**				
1	Bheri Corridor 400 kV Transmission Line	Bafikot	400		
2	Lekhnath Damauli 220 kV Transmission Line	Lekhnath	132/33	1 Ø, 7x53.33 Bank	320
		Damauli	132/33	3 Ø, 63	63
3	Borang Ratmate 220 kV Transmission Line	Borang	132/33		
		Lapan	220/132		
4	Tumlingtar Sitalpati 220 kV Transmission Line	Sitalpati	220/132 132/33	1 Ø, 7x33.33 Bank 1 Ø, 4x8 Bank	224
5	Balefi Barhabise 132 kV Transmission Line	Pangtang (Balefi)	132/33	3 Ø, 30	30
6	Ghorahi Madichaur 132 kV Transmission Line	Madichaur	132/33	3 Ø, 45	45
7	Dhalkebar Loharpati 132 kV Transmission Line	Loharpatti	132/33 33/11	3 Ø, 2x30 3 Ø, 16	76
8	Dadakhet Rahughat132 kV Transmission Line	Dadakhet	132/33	3 Ø, 30	30
		Rahughat	220/132	1 Ø, 4x33.33 Bank	100
9	Kaligandaki Ridi132 kV Transmission Line	Ridi	132/33 33/11	3 Ø, 30 3 Ø, 8	38
10	Keraun 132 kV Substation	Keraun	132/33	3 Ø, 2x63	126
11	Lalbandi Salimpur 132 kV Transmission Line	Salimpur	132/33	3 Ø, 63	63
12	Dhalkebar Balganga 132 kV Transmission Line	Balganga	132/33	3 Ø, 2x63	126
13	Bhumahi Hakui132 kV Transmission Line	Hakui	132/33	3 Ø, 63	63

S.No	Namae of Project	Substation	Voltage Level (Ratio) kV	Capacity MVA	Total Capacity MVA
14	Godak Anarmani 132 kV Transmission Line	Anarmani	132/33	3 Ø, 63	63
15	Inaruwa Dharan 132 kV Transmission Line	Dharan	132/33	3 Ø, 63	63
16	Kohalpur Nepalgunj 132 kV Transmission Line	Nepalgunj	132/33	3 Ø, 63	63
17	Pathalaiya Harniya 132 kV Transmission Line	Harniya	132/33	3 Ø, 63	63
18	New Pokhara 132 kV Substation	Birauta	132/11	3 Ø, 30	30
19	Lamahi Ghorahi 132 kV Substation Expansion	Ghorahi	132/33	3 Ø, 30	30
Total					**1616**
I	**Project Managment Directorate**				
1	Kathmandu valley 220 kV Ring Main Project	Kathmandu	220/132	400	490
			132/11	90	
		Bhaktapur	220/132	400	490
			132/11	90	
		Lalitpur	220/132	400	490
			132/11	90	
2	New Butwal - Lamahi - Kohalpur - New Lamki - New Attariya 400 kV Transmission Line Project	Lamahi SS	400/220/132	630	720
			132/11	90	
		New Kohalpur SS	400/220/132	630	720
			132/11	90	
		New Attariya SS (Daiji)	400/220/132	630	720
			132/11	90	
3	Tingla Hub-Likhu Hub- New Khimti 400 kV TL Project	Likhu Hub SS	400/220/132	630	630
4	New Khimti-Tamakoshi 3-Sunkoshi Hub-Dhalkebar 400 kV TL Project	Sunkoshi Hub SS	400/220/132	630	630
5	Budhigandaki corridor 400 kV TL Project	Philim / Gumda	400/220/132	630	
6	Dailekh - kalikot - Jumla 132 kV Project	Kalikot	132/33	63	108
			132/11	45	
		Jumla	132/33	63	108
			132/11	45	
7	Damauli - Kushma - Burtibang - Banfikot Project	Kushma	400/220/132	630	630
		Burtibang	400/220/132	630	630
		Banfikot	400/220/132	630	630
8	Lamosangu - Kavre / Ramechhap 132 kV TL Project	Kavre/Ramechhap	132/33	63	108
			132/11	45	
Total					**7104**

Note : Above Projects are in the phase of detail study and the indicated capacity of Substation may change.

Table 7: Major completed upgradation and reinforcement works of grid substations

SN	Substation	Voltage Ratio kV	Previous Capacity MVA	New Capacity MVA	Remarks
1	Godak	132/33	30	63	30 MVA was replaced by new 63 MVA
2	Siuchatar	132/66	113.4	113.4	Old 3X12.6 MVA were replaced by new 3x12.6 MVA
3	Patan	66/11	54	72	A new 18 MVA transformer bay was installed
4	Butwal	33/11	33.2	49.8	A new 16.6 MVA transformer bay was installed
5	Kohalpur	132/33	60	93	30 MVA was replaced by new 63 MVA
6	Bharatpur	132/11	37.5	52.5	15 MVA was replaced by new 30 MVA
7	Anarmani	33/11	24.6	33.2	8 MVA was replaced by new 16.6 MVA
8	Lekhnath	132/33	12.5	30	30 MVA was shifted from Lamahi replacing existing 12.5 MVA
9	Chanauta	33/11	6	11	8 MVA was shifted from Lamki replacing existing 3 MVA
10	Kawasoti	132/33	30	30	15 MVA was shifted from Modi P/H replacing damaged 30 MVA transformer 30 MVA was shifted from Kohalpur S/S replacing 15 MVA
11	Indrawati	66/11	7.5	10	10 MVA was shifted from Banepa S/S replacing existing 7.5 MVA
12	Modi	132/33	15	30	30 MVA was shifted from Godak S/S replacing existing 15 MVA
13	a. Installation of 132 kV, 20 MVAr Capacitor Bank at Lahan S/S. b. Installation of 33 kV, 12.5 MVAr Capacitor Bank at Chandranigahpur S/S. c. Installation of 11 kV, 10 MVAr Capacitor Bank at Pathlaiya S/S.				

Table 8: Major ongoing upgradation and reinforcement works of grid substations

SN	Substation	Voltage Ratio, kV	Existing Capacity, MVA	New Capacity, MVA	Remarks
1	Dhalkebar	220/132	320	950	New 2x315 MVA transformers with associated bays
2	Kamane	132/33	30	63	30 MVA to be replaced by new 63 MVA
3	Bharatpur	132/11	52.5	82.5	22.5 MVA to be replaced by new 30 MVA.
4					New 22.5 MVA to be installed in the spare Bay.
5	Siuchatar	132/11	0	30	A new 30 MVA transformer with associated bay
6	Bhaktapur	132/11	45	67.5	A new 22.5 MVA transformer with associated bay
7	Kawasoti	132/33	30	60	A new 30 MVA transformer with associated bay
8	Chanauta	132/33	42.5	60	12.5 MVA to be replaced by new 30 MVA
9	Bardaghat	132/11	30	45	7.5 MVA to be replaced by new 22.5 MVA
10	Lekhnath	132/11	22.5	45	A new 22.5 MVA transformer to be Installed at spare Bay of Lekhnath S/S
11	Dhalkebar	33/11	24.6	33.2	8 MVA to be replaced by new 16.6 MVA
12	Kohalpur	33/11	19.6	33.2	3 MVA to be replaced by new 16.6 MVA
13	Parwanipur	132/66	126	189	A new 63 MVA transformer with associated bay
14	Bhaktapur	132/66	49.5	99	A new 49.5 MVA transformer with associated bay
15	Baneshwor	66/11	36	60	2x18 MVA to be replaced by new 2x30 MVA

SN	Substation	Voltage Ratio, kV	Existing Capacity, MVA	New Capacity, MVA	Remarks
16	Balaju	66/11	45	67.5	A new 22.5 MVA transformer with associated bay
17	Birgunj	66/11	25	60	2x12.5 MVA to be replaced by new 2x30 MVA
18	Mahendranagar	132/33	25	60	15 MVA to be shifted from Kawasoti S/S replacing 10 MVA.
					2x15MVA to be replaced by new 2x30 MVA
19	Ghorahi	33/11	0	16.6	A new 16.6 MVA transformer with associated bay
20	Dhalkebar	132/33	93	126	30 MVA to be replaced by new 63 MVA
21	Hetauda	66/11	20	60	2x10 MVA to be replaced by new 2*30 MVA
22	Chapur	132/33	60	126	2x30 MVA to be replaced by new 2x63 MVA
23	Chapur	33/11	8	16.6	8 MVA to be replaced by new 16.6 MVA
24	Pathlaiya	132/33	0	30	30 MVA to be shifted from Kamane
25	Damak	132/33	30	93	10 MVA to be installed in spare bay.
					10 MVA to be replaced by new 63 MVA.
26	Kohalpur	132/33	93	126	30 MVA to be replaced by new 63 MVA
27	Chanauta	33/11	11	24.6	3 MVA to be replaced by new 16.6 MVA
28	Chabahil	66/11	67.5	90	A new 22.5 MVA transformer to be installed
29	Lamosanghu	132/33	30	63	30 MVA to be replaced by new 63 MVA
30	Parwanipur	132/11	67.5	90	A new 22.5 MVA transformer and its associated bays to be Installed
31	Lamahi	132/33	93	126	30 MVA to be replaced by new 63 MVA
32	Duhabi	33/11	33.2	48	2x16.6 MVA to be replaced by new 2x24 MVA
33	Anarmani	132/33	60	126	2x30 MVA to be replaced by new 2x63 MVA
	Anarmani	33/11	33.2	48	2x16.6 MVA to be replaced by new 2x24 MVA
34	Damak	33/11	16.6	33.2	A new 16.6 MVA transformer with associated bay
35	Attaria	132/33	60	126	2x30 MVA to be replaced by new 2x63 MVA
36	Attaria	33/11	16.6	33.2	A new 16.6 MVA transformer with associated bay
37	Mahendranagar	33/11	7.5	16.6	7.5 MVA to be replaced by new 16.6 MVA
38	Duhabi	132/33	189	315	3x63 MVA to be replaced by new 3x105 MVA
39	Lamahi	33/11	16.6	24.6	8 MVA to be shifted from Dhalkebar S/S and installed in spare bay at Lamahi
40	Bagmati HPP	66/11	6		Shifting of 66/11 kV, 6 MVA Transformer from Chilime P/H and installation at Bagmati HPP with construction of new transformer bay.
Capacitor Banks					
41	Butwal	Installation of 33 kV, 20 MVAr Capacitor Bank at Butwal S/S			
42	Bardaghat	Installation of 11 kV,2x5 MVAr Capacitor Bank at Bardaghat S/S			

Table 9: Details of Approved Position and Working Employees under Transmission Directorate

S.N.	Position	Level	Service	Group	Approved Position	Working Employee
1	Deputy Managing Director	12	Technical	-	1	1
2	Director	11	Technical	-	4	2
3	Joint Director	10	Administration	Administration	1	1
4	Joint Director	10	Administration	Finance	1	0
5	Manager	10	Technical	Electrical	7	4
6	Deputy Director	9	Administration	Finance	0	1

S.N.	Position	Level	Service	Group	Approved Position	Working Employee
7	Deputy Manager	9	Technical	Electrical	9	6
8	Deputy Manager	9	Technical	Electronic	1	1
9	Deputy Manager	9	Technical	Civil	1	1
10	Assistant Director	8	Administration	Administration	1	0
11	Assistant Director	8	Administration	Finance	1	0
12	Assistant Manager	8	Technical	Electrical	19	15
13	Assistant Manager	8	Technical	Electronic	3	3
14	Assistant Manager	8	Technical	Mechanical	1	1
15	Assistant Manager	8	Technical	Civil	3	3
16	Administration Officer	7	Administration	Administration	6	3
17	Finanace Officer	7	Administration	Finance	4	5
18	Engineer	7	Technical	Electrical	46	34
19	Engineer	7	Technical	Electronic	4	3
20	Engineer	7	Technical	Civil	20	7
21	Survey Officer	7	Technical	Survey	2	2
22	Assistant Administration Officer	6	Administration	Administration	5	8
23	Assistant Finance Officer	6	Administration	Finance	5	4
24	Assistant Computer Officer	6	Administration	Computer	0	1
25	Assistant Engineer	6	Technical	Electrical	39	34
26	Assistant Engineer	6	Technical	Civil	3	0
27	Senior Assistant(Mi.Ri. Su.Bha)	5	Administration	Administration	10	13
28	Accountant/ Store Keeper	5	Administration	Finance	10	12
29	Computer Operator	5	Administration	Administration	0	2
30	Supervisor	5	Technical	Electrical	128	119
31	Supervisor	5	Technical	Mechanical	0	2
32	Supervisor (Draft Man)	5	Technical	Civil	7	3
33	Senior Communication Equipment Operator	5	Technical	Electronic	1	1
34	Senior HeavyEquipment Operator	5	Technical	Vechical Driver	10	6
35	Office Assistant/ Si. Mi.Ri.	4	Administration	Administration	5	4
36	Assistant Accountant Assistant Store Keeper	4	Administration	Finance	12	10
37	Foreman	4	Technical	Electrical	58	79
38	Foreman	4	Technical	Mechanical	2	0
39	Foreman Driver	4	Technical	Vechical Driver	13	13
40	Clerk (Mi. Ri)	3	Administration	Administration	1	0
41	Electrician	3	Technical	electrical	176	142
42	Driver	3	Technical	Vechical Driver	13	13
43	Office Helper -2	2	Administration	Administration	37	22
44	Helper	2	Technical	Electrical	73	56
45	Office Helper -1	1	Administration	Administration	21	6
46	Junior Helper	1	Technical	Electrical	15	7
Total					**779**	**650**

Total Energy Transaction through Transmission Line and Substation: 7583.92 GWh

Total nos. of Employees in Transmission Directorate: 650

Energy Transaction per Employee: 11.67 GWh

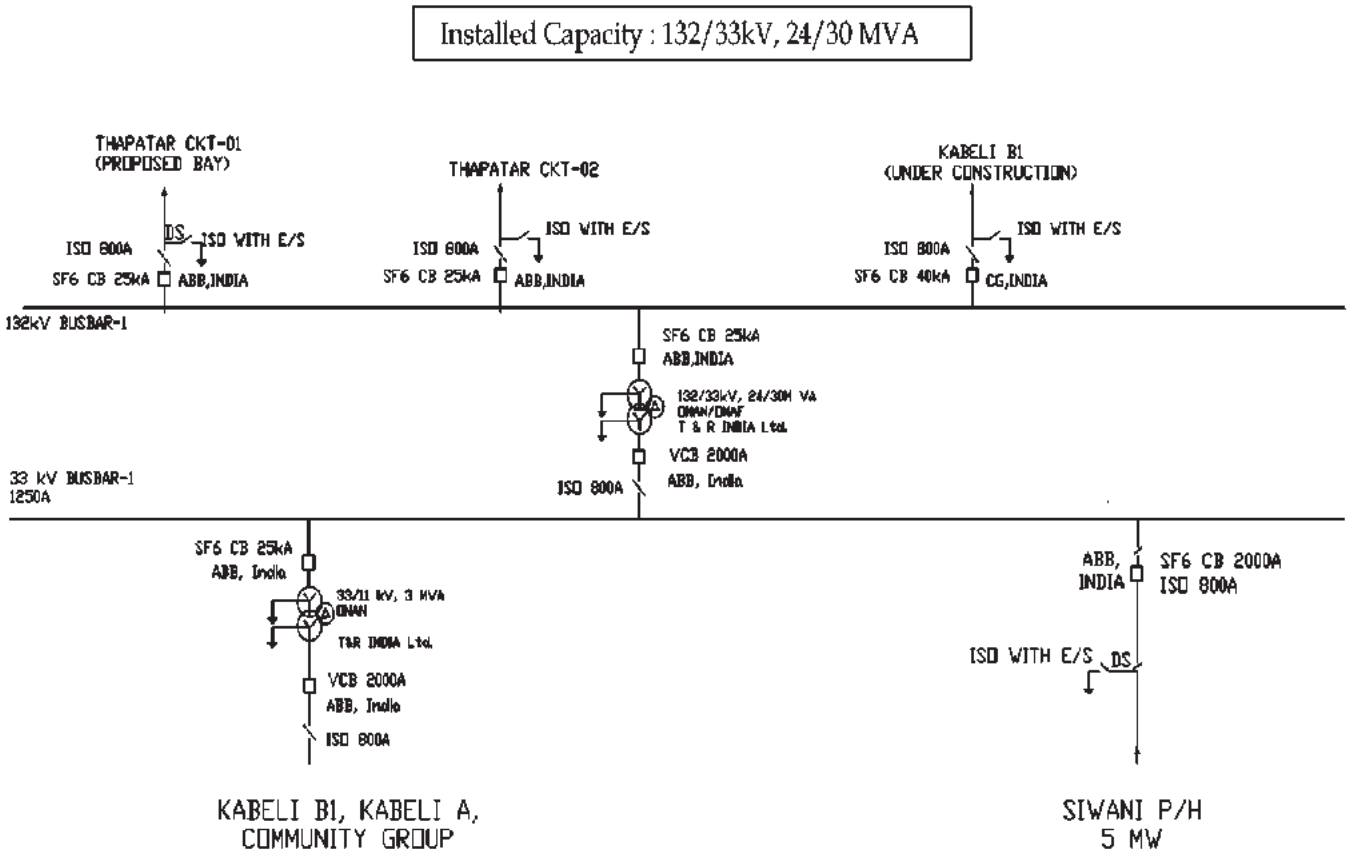
Annexure C: List of Existing Substation Single Line Diagram (SLD)

S.N.	Name of Substation
1	Amarpur (Kabeli) 132/33 kV Substation
2	Phidim 132/33 kV Substation
3	Godak 132/33 kV Substation
4	Damak 132/33 kV Substation
5	Anarmani 132/33 kV Substation
6	Duhabi 132/33 kV Substation
7	Kushaha 132 kV Switching Station
8	Rupani 132/33 kV Substation
9	Lahan 132/33 kV Substation
10	Mirchaiya 132/33 kV Substation
11	Dhalkebar 220/132 kV Substation
12	Chandranigahapur 132/33 kV Substation
13	Pathlaiya 132/11 kV Substation
14	New Parwanipur 132/66 kV Substation
15	Birgunj 66/33 kV Substation
16	Simra 66/11 kV Substation
17	Amlekhgunj 66/11 kV Substation
18	Kamane 132/33 kV Substation
19	Hetauda 132/66 kV Substation
20	Bharatpur 132/33 kV Substation
21	Balaju 132/66 kV Substation
22	Chapali 132/66 kV Substation
23	Siuchatar 132/66 kV Substation
24	New Chabel 66/11 kV Substation
25	Lainchour 66/11 kV Substation
26	New Patan 66/11 kV Substation
27	Teku 66/11 kV Substation
28	K3 66/11 kV Substation

S.N.	Name of Substation
29	Baneswor 66/11 kV Substation
30	Bhaktapur 132/66 kV Substation
31	Banepa 66/11 kV Substation
32	Panchkhal 66/11 kV Substation
33	Lamosanghu 132/33 kV Substation
34	Matatirtha 132/33 kV Substation
35	Indrawati 66/11 kV Substation
36	Damauli 132/33 kV Substation
37	Pokhara 132/11 kV Substation
38	Lekhnath 132/33 kV Substation
39	Markichowk 132/33 kV Substation
40	Syangja 132/33 kV Substation
41	Butwal 132/33 kV Substation
42	Bardghat 132/11 kV Substation
43	Gandak 132 kV Switching Station
44	Chanauta 132/33 kV Substation
45	Lamahi 132/33 kV Substation
46	Ghorahi 132/33 kV Substation
47	Kawasoti 132/33 kV Substation
48	Kusum 132/11 kV Substation
49	Hapure 132/33 kV Substation
50	Attaria 132/33 kV Substation
51	Kohalpur 132/33 kV Substation
52	Lamki 132/33 kV Substation
53	Mahendranagar 132/33 kV Substation
54	Bhurigaon 132/33 kV Substation
55	Pahalmanpur 132/33 kV Substation
56	Syaule 132/33 kV Substation

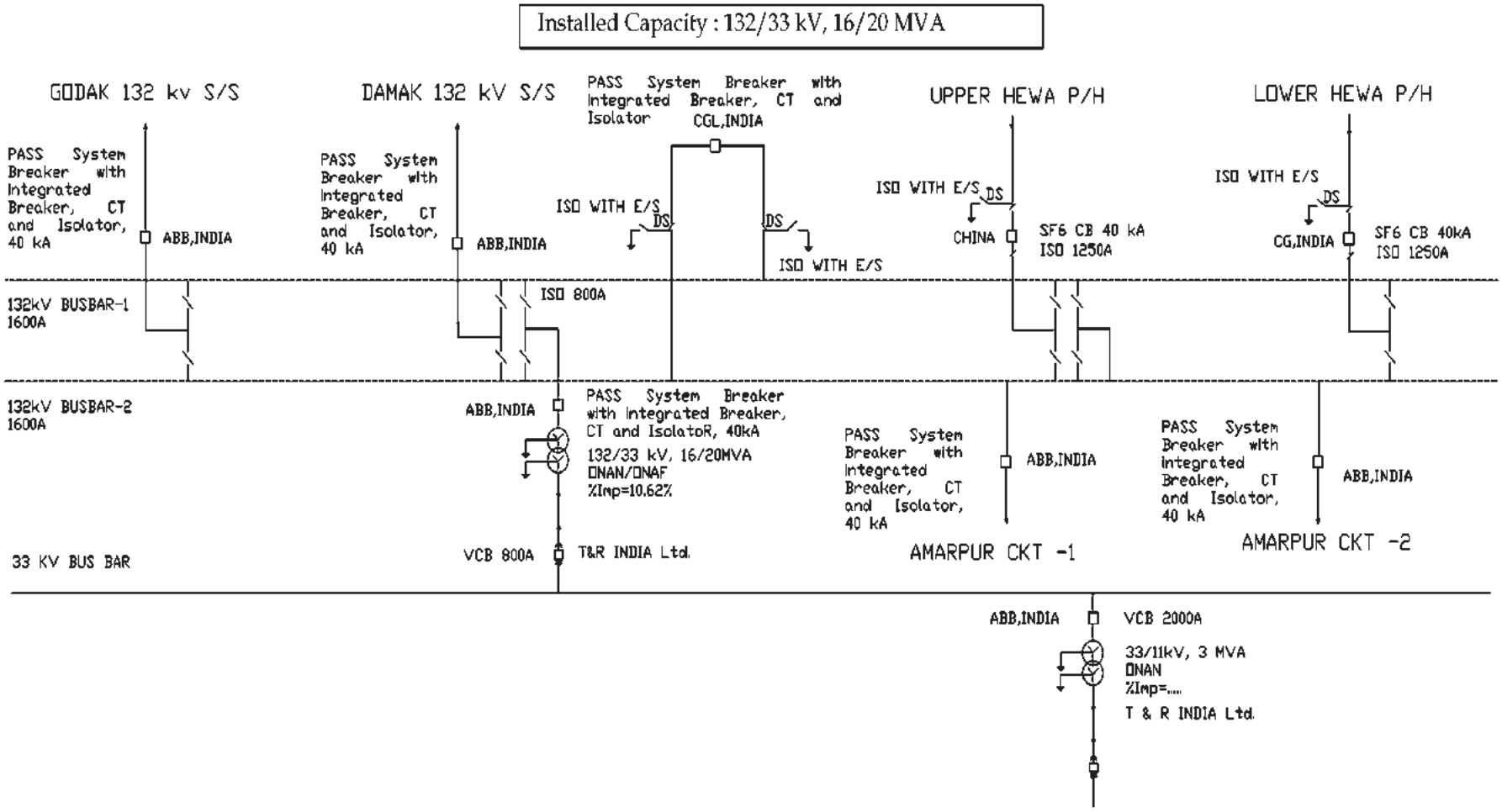
1. AMARPUR SUBSTATION

Amarpur substation with Double Bus bar system, located at Amarpur of Panchthar district of Mechi Zone and connected to Thapatar 132 kVSub Stations. This substation receives power from Siwani Hydro (5MW) via 33 kV single circuit line. This substation was commissioned in 2015 with 132/33 kV, 24/30 MVA capacity. It also consists of 33/11 kV, 3 MVA capacity transformer supplying to local feeder kabeli B1, kabeli A and a community group.



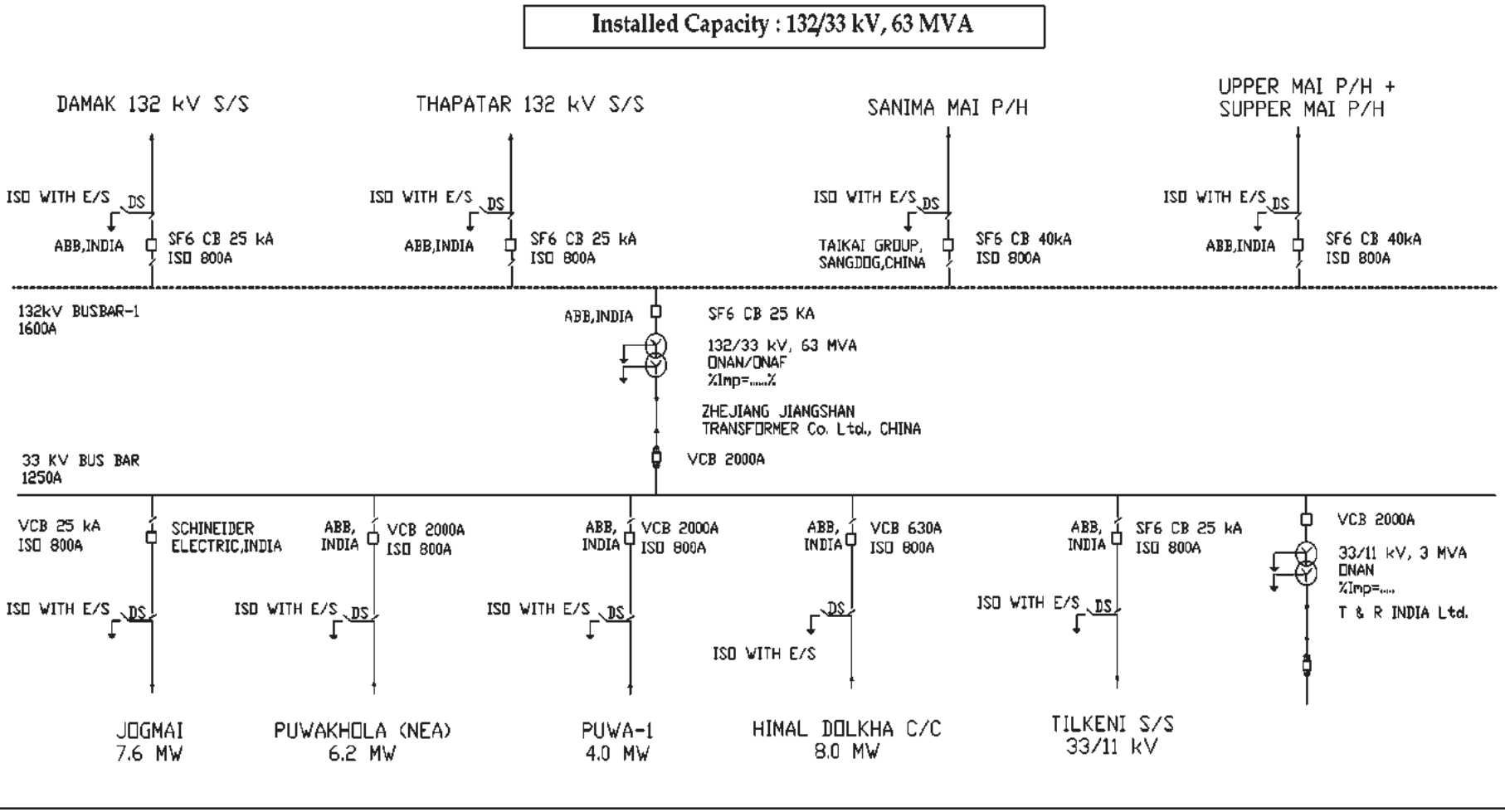
2. PHIDIM (THAPATAR) SUBSTATION

Thapatar substation with Double Bus bar system, located at Thapatar, Phidim of Panchthar district of Mechi Zone and connected to Godak and Damak Sub Stations. This substation is receives power from Upper Hewa (15MW) and Lower Hewa (22.5MW) by 132kV single circuit line. It is also connected to Amarpur substation by 132kV double circuit line. This substation was commissioned in 2015 with 132/33 kV, 20 MVA capacity. It also consists of 33/11 kV, 3 MVA capacity transformer supplying to local feeder Yasok.



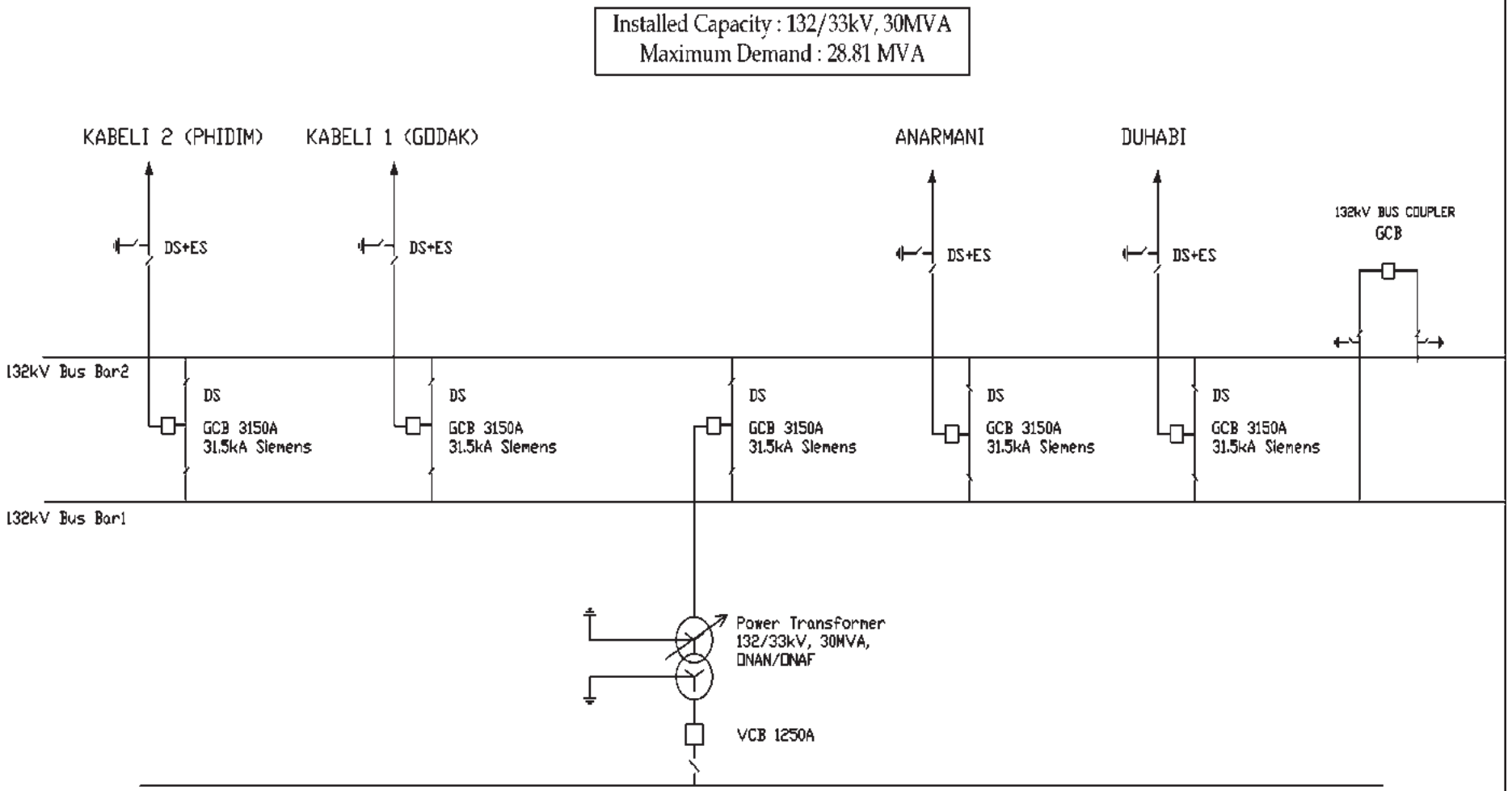
3. GODAK (ILAM) SUBSTATION

Godak substation with Single Bus bar system, located at Godak of Ilam district of Mechi Zone and connected to Damak and Thapatar 132 kV Sub Stations. This substation is receives power from Sanima Mai (30MW), Upper Mai (18.1MW), Supper Mai(7.8MW) by 132 kV single circuit line and Himal Dolkha C/C (8MW), Himal Dolkha (4.5MW), Puwakhola NEA (6.2MW), Puwa-1 (4MW) by 33 kV single circuit line and Jogmai (7.6MW) by 33 kV double circuit line and 33/11 kV, 8MVA Tlkeni Substation by 33 kV single circuit line. This substation was commissioned and charged in 2015 with 132/33 kV, 30 MVA capacity and later on 2018 the capacity is upgraded to 63MVA. It also consists of 33/11 kV, 3 MVA capacity transformer supplying to Soktim local feeder.



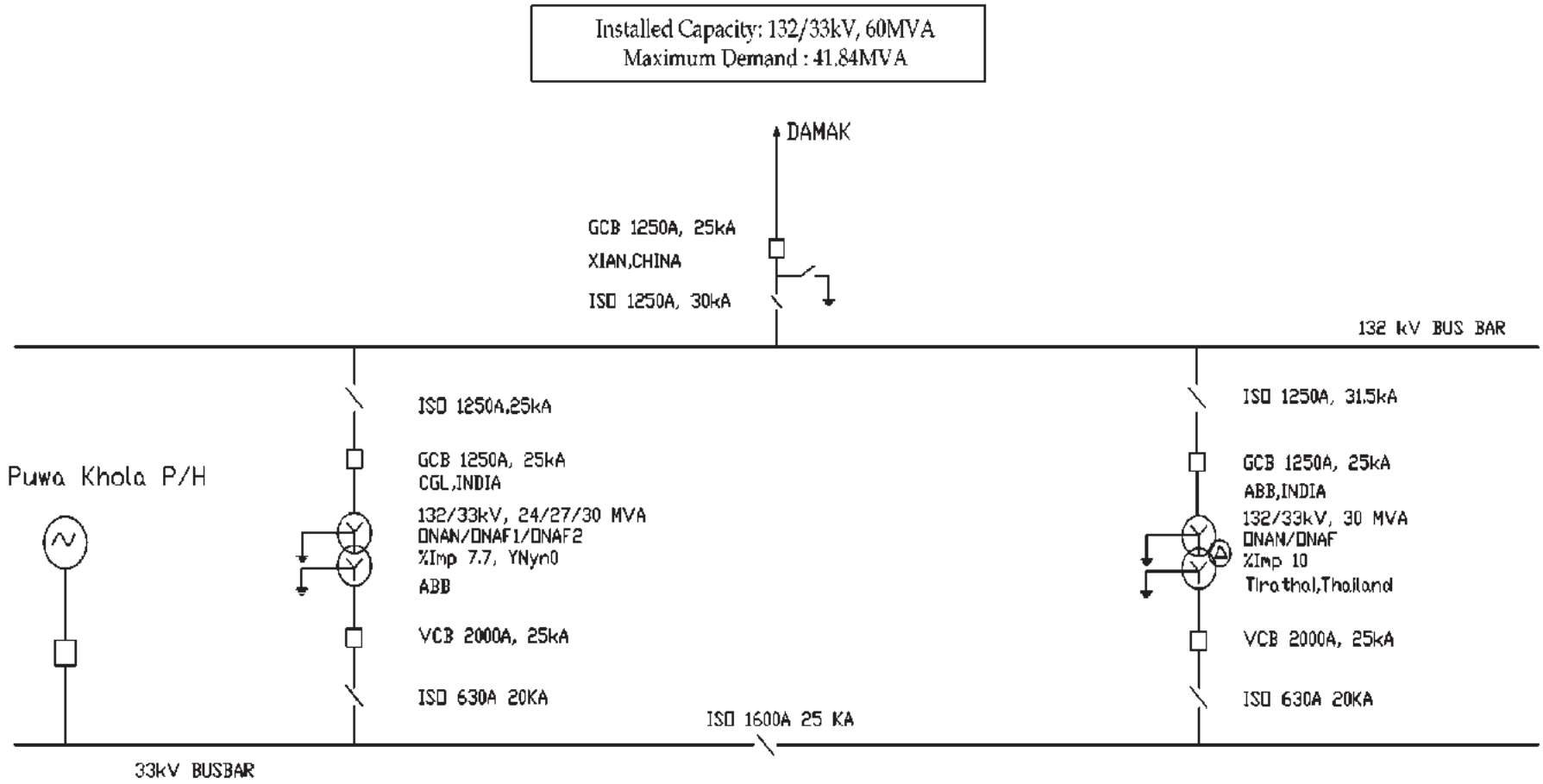
4. DAMAK SUBSTATION

Damak substation located at Damak of Jhapa District, Mechi Zone, feeds power to Damak, Panchgachi, Kerkha and Padajungi area. This Substation is connected to Duhabi and Anarmani by 132 kV single circuit line and Kabeli Corridor through double circuit line. This Substation was commissioned in 2015 with 132/33kV, 30MVA capacity.



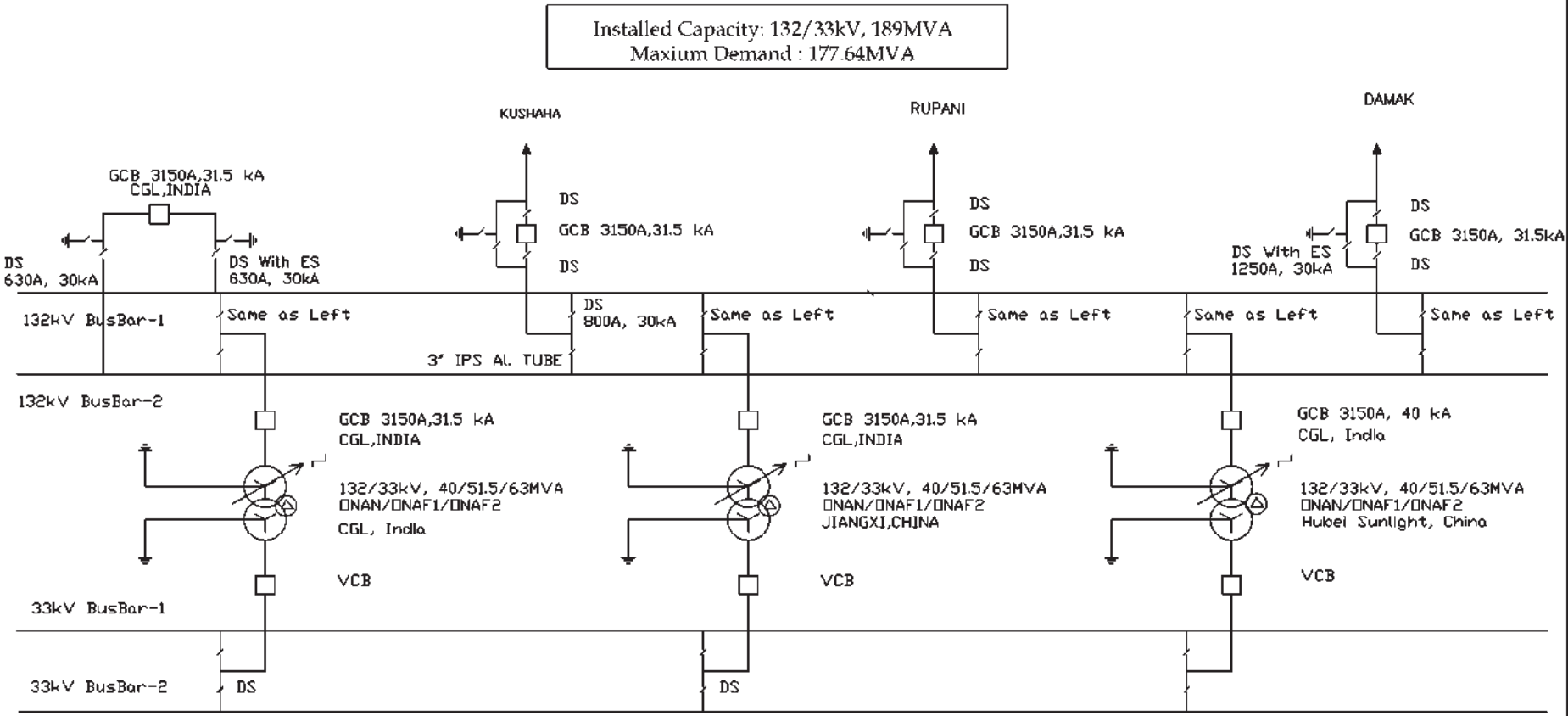
5. ANARMANI SUBSTATION

Anarmani substation with single bus system, located at Anarmani of Jhapa district Mechi Zone feeds power to Dhulabari, Damak, Ilam, Chandragadhi, Suranga and Garamani. This substation is connected to Duhabi Substation by 132kV single circuit line. Puwakhola Power Station, 5.3 MW, is connected to this substation by 33kV transmission Line. This substation was commissioned in 1992 with 132/33 kV two numbers of 7.5 MVA transformers and was upgraded to 2x15 MVA in 2003 and 2004. In 2007, one of 2x15MVA transformers was upgraded to 30MVA. Further existing 15 MVA Transformer was replaced by 30 MVA in 2009.



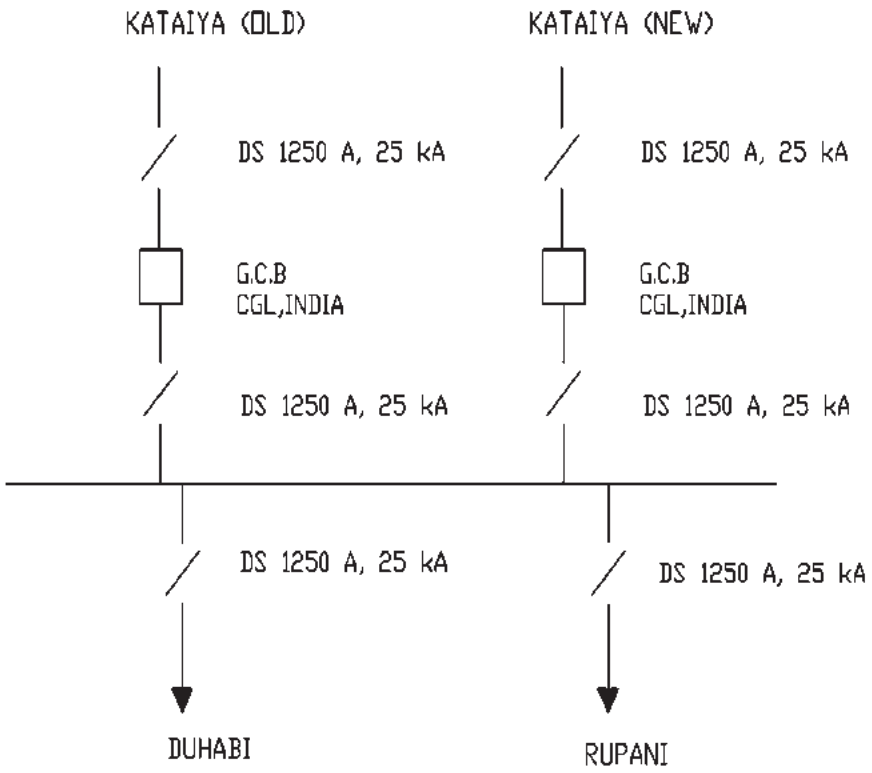
6. DUHABI SUBSTATION

Duhabi substation with double bus sytem, located at Duhabi of Sunsari district of Koshi Zone feeds power to Biratnagar, Inaruwa, Dharan and Duhabi. This substation is connected to Lahan and Kushaha substations by 132kV double circuit and with Anarmani by Single Circuit Line. This substation was commissioned in 1985 with 132/33 kV, 30 MVA capacity. This substation was upgraded to 60 MVA, with additional installation of 30 MVA transformer in 1995. In 2004, one 30MVA transformer was replaced by 63MVA. Replacement of another 30 MVA transformer with 40/51.5/63 MVA transformer was completed in 2009. Capacitor banks with capacity of 2x6.07 MVAR were installed in 1996 and 3x10MVAR in 2003 for voltage improvement. Multifuel Power station, 39MW, is connected to this substation by 4 km double circuit transmission line. Kataiya Power Station in India is also connected by double circuit 33kV line. Further new 132/33kV, 63MVA Transformer Bay was installed in 2017.



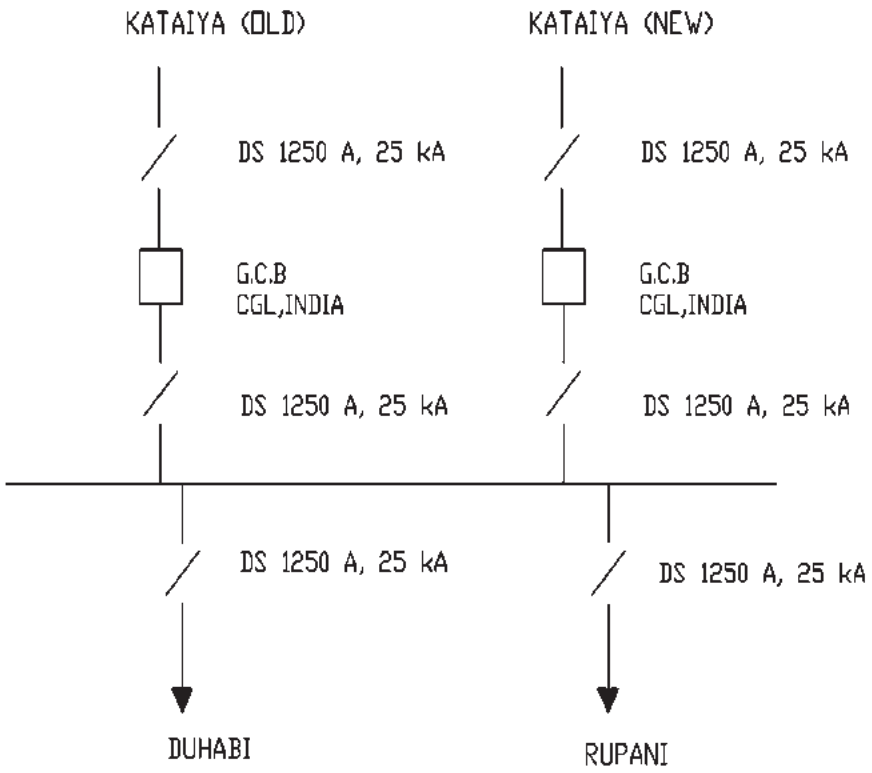
7. KUSHAHA SWITCHING STATION

Kusaha switching station located at kushaha of Sunsari district of Koshi Zone was consttructed to import the power from Kataiya, India. This switching station is connected to Lahan and Duhabi substations 132kV line, to evacuate the imported power to the eastern region. It was built in 1999 without Circuit Breaker and protection system. In 2006, a circuit breaker and complete protection system were installed on Kataiya Line .



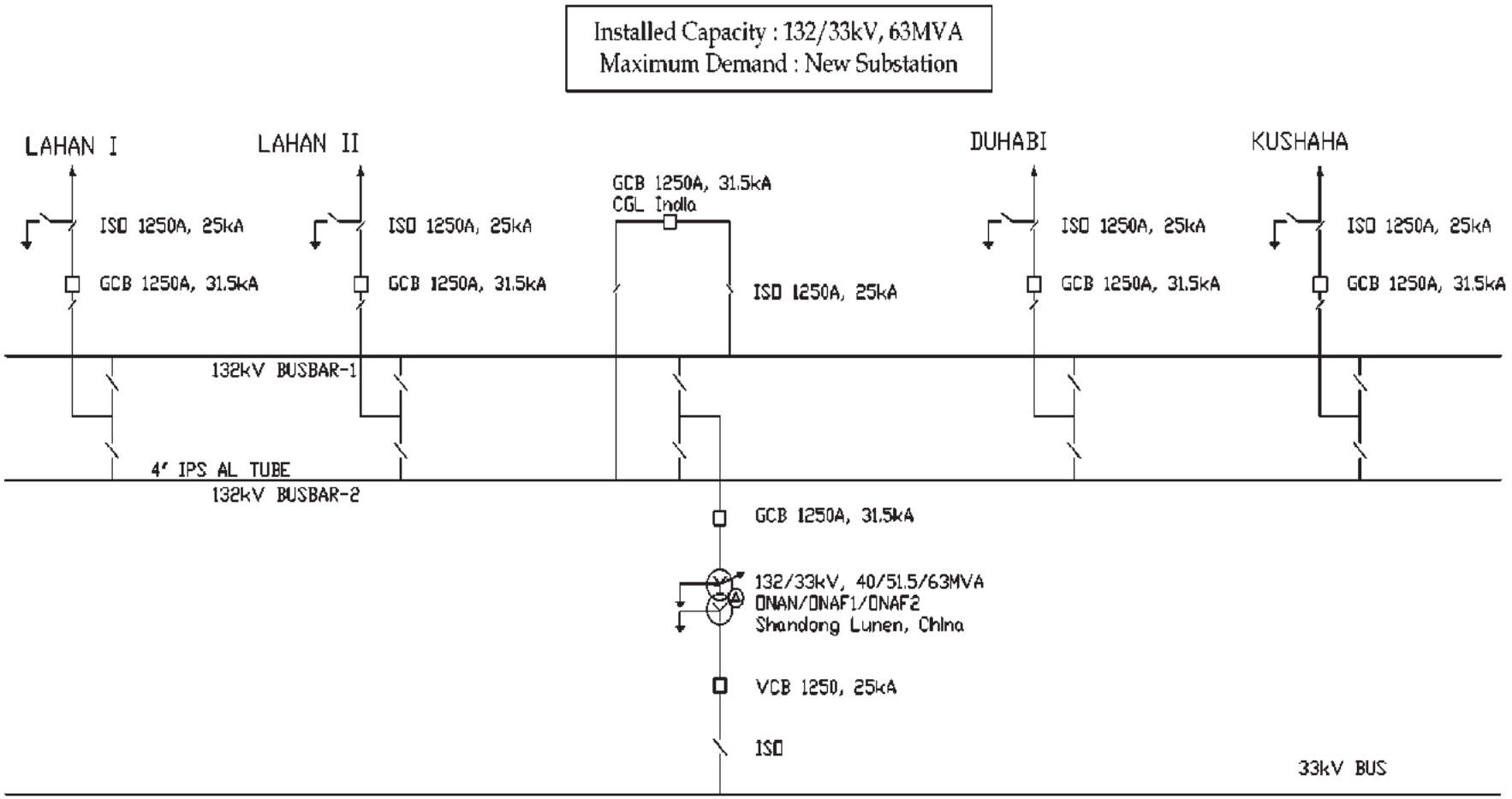
7. KUSHAHA SWITCHING STATION

Kusaha switching station located at kushaha of Sunsari district of Koshi Zone was consttructed to import the power from Kataiya, India. This switching station is connected to Lahan and Duhabi substations 132kV line, to evacuate the imported power to the eastern region. It was built in 1999 without Circuit Breaker and protection system. In 2006, a circuit breaker and complete protection system were installed on Kataiya Line .



8. RUPANI SUBSTATION

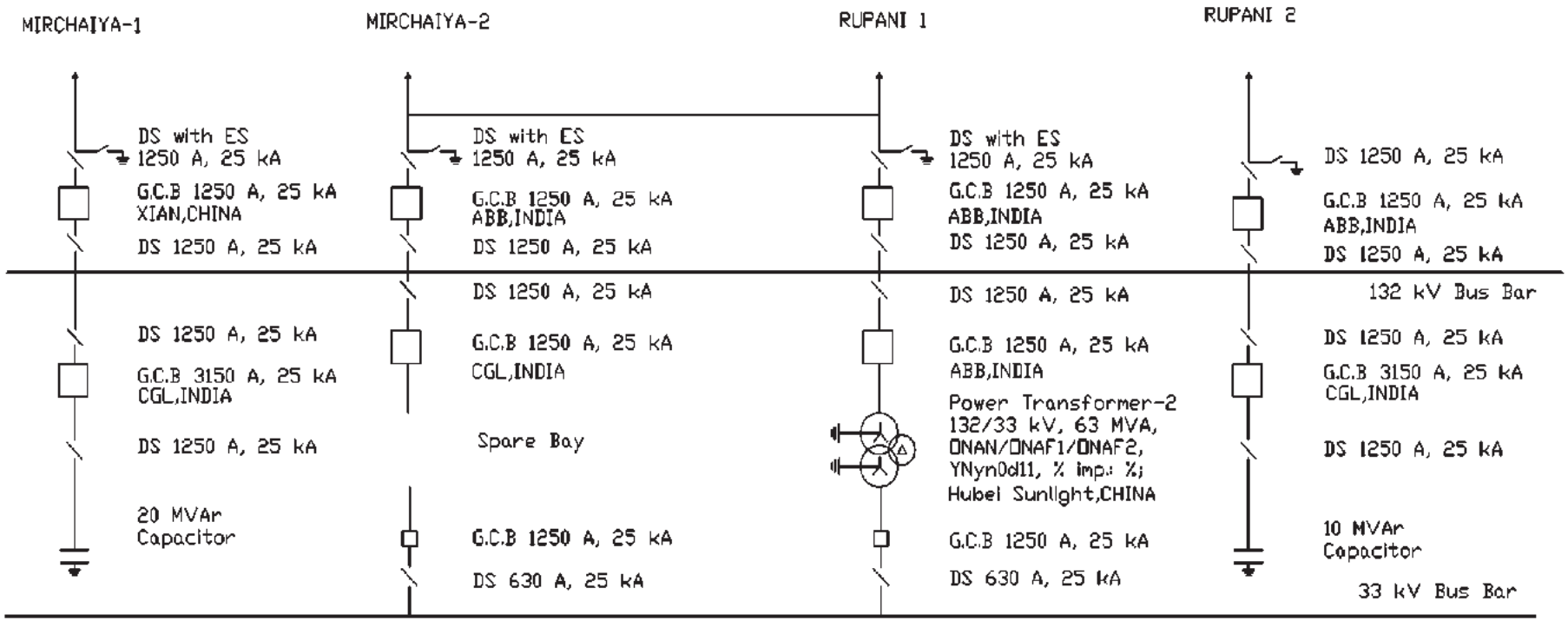
Rupani Substation with Double Bus System located at Rupani of Saptari district, Sagarmatha zone feeds power to Rajbiraj, Bodebarsain, Balardah and Rupani. This Substation is connected with Duhabi Sustation and Lahan Substation through Double Circuit 132kV line The line 2 is connected to Duhabi Substation through Kusaha switching station. This Substation was commissioned in 2019 with 132/33kV, 63MVA capacity.



9. LAHAN SUBSTATION

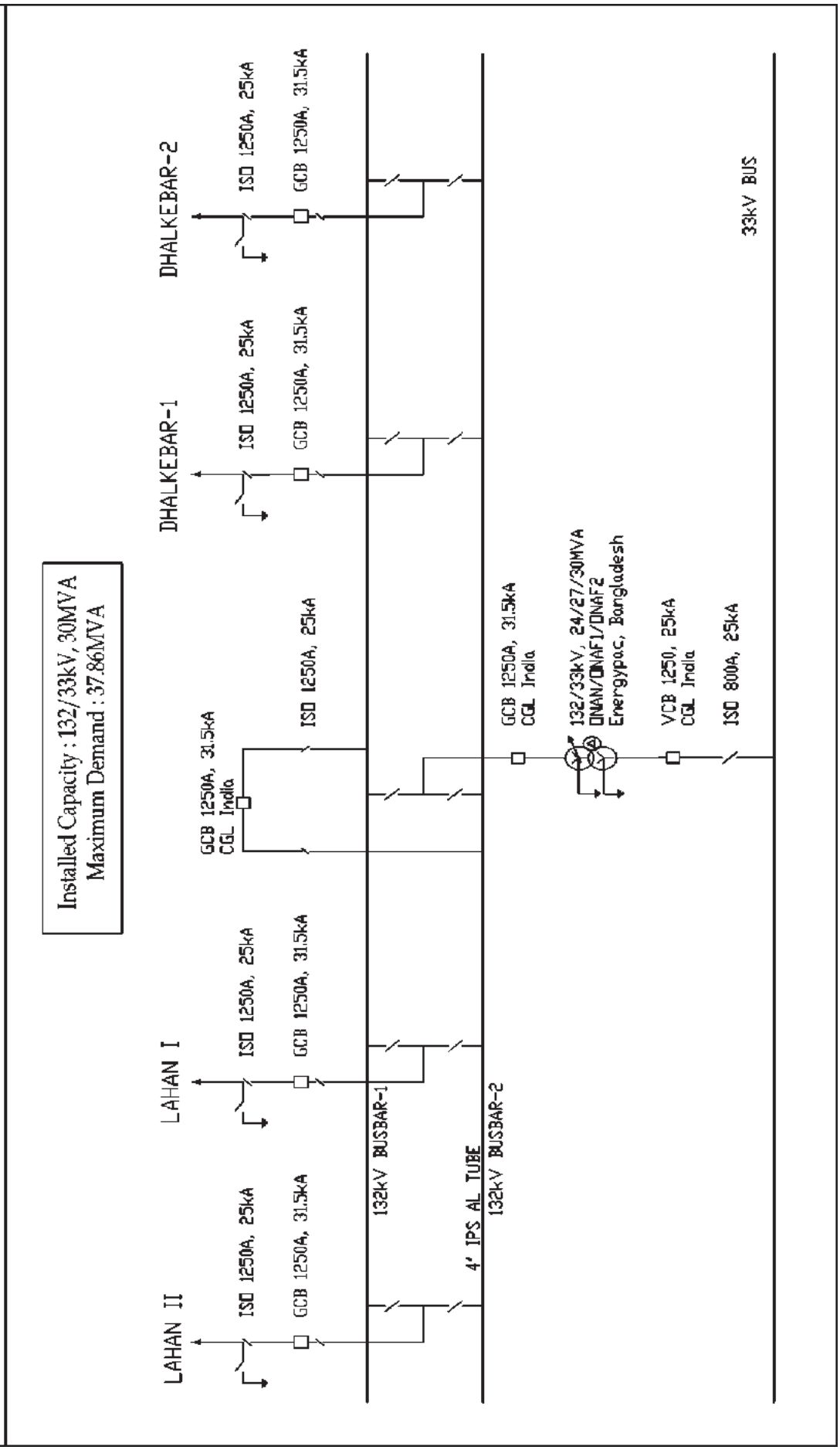
Lahan Substation with single busbar sytem, located at Lahan of Siraha district of Sagarmatha zone feeds power to Rajbiraj, Rupani, Jaljale and Bastipur. This substation is connected to Dhalkebar and Duhabi by 132kV double circuit line . This substation was commissioned in 1992 with 132/33 kV two numbers of 12.5 MVA transfomers. The Kusaha and Dhalkebar-II bays were constructed in 1999. The line 2 is connected to Duhabi substation through Kusaha switching station. In 2004, one 12.5MVA transformer got damaged and was replaced by 10 MVA. The 10MVA Transformer was further upgraded to 20MVA in 2006. The existing 12.5 MVA was replaced by new 63MVA Transformer in 2011.

Installed Capacity: 132/33kV, 63MVA
Maximum Demand: 42.98MVA



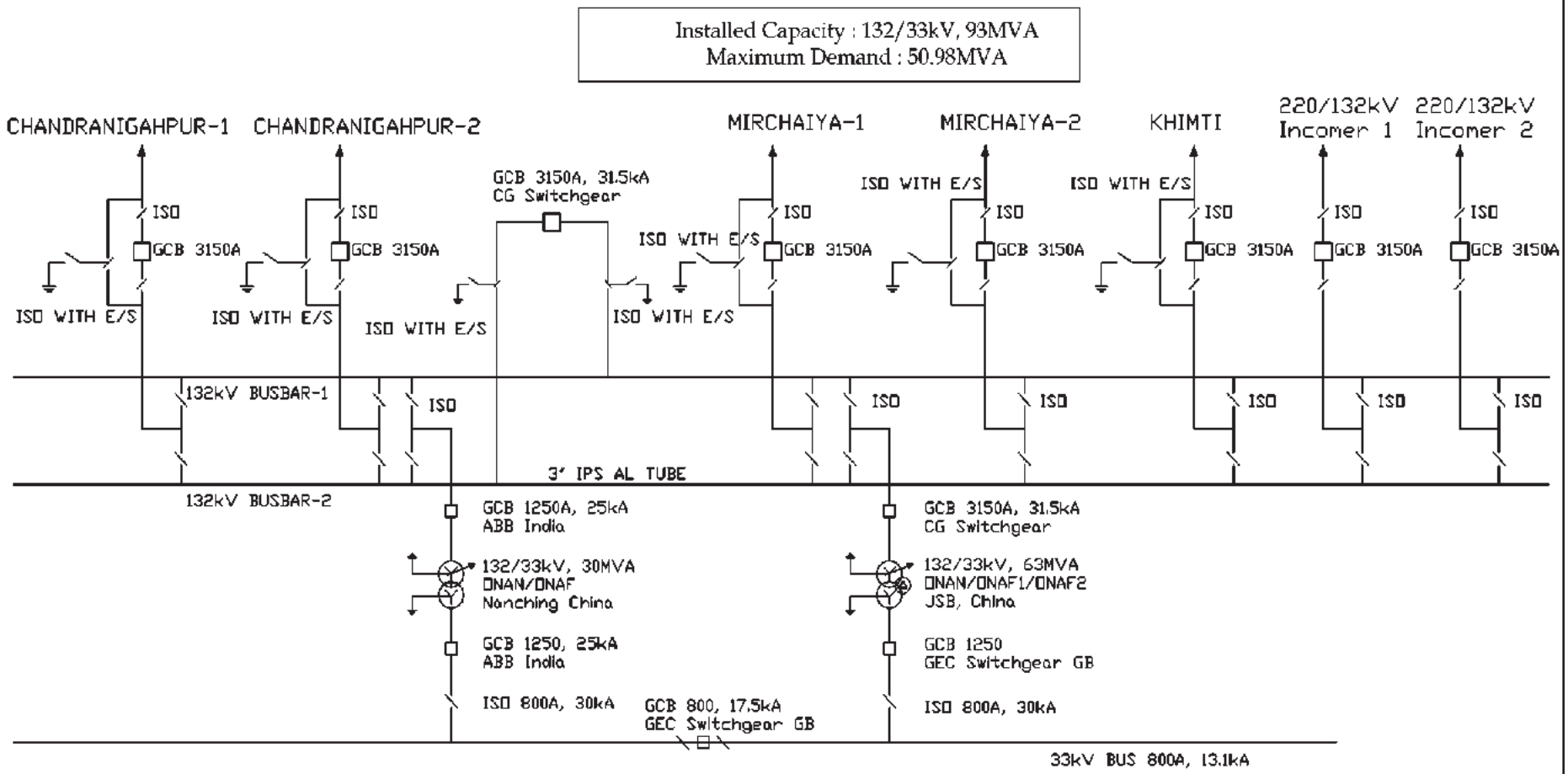
10. MIRCHAIYA SUBSTATION

Mirchaiya Substation with Double Bus System located at Mirchaiya of Siraha district, Sagarmatha zone feeds power to Katari and Mirchaiya. This Substation is connected with Dhalkebar Sustation and Lahan Substation through Double Circuit 132kV line. This Substation was commissioned in 2017 with 132/33kV, 30MVA capacity.



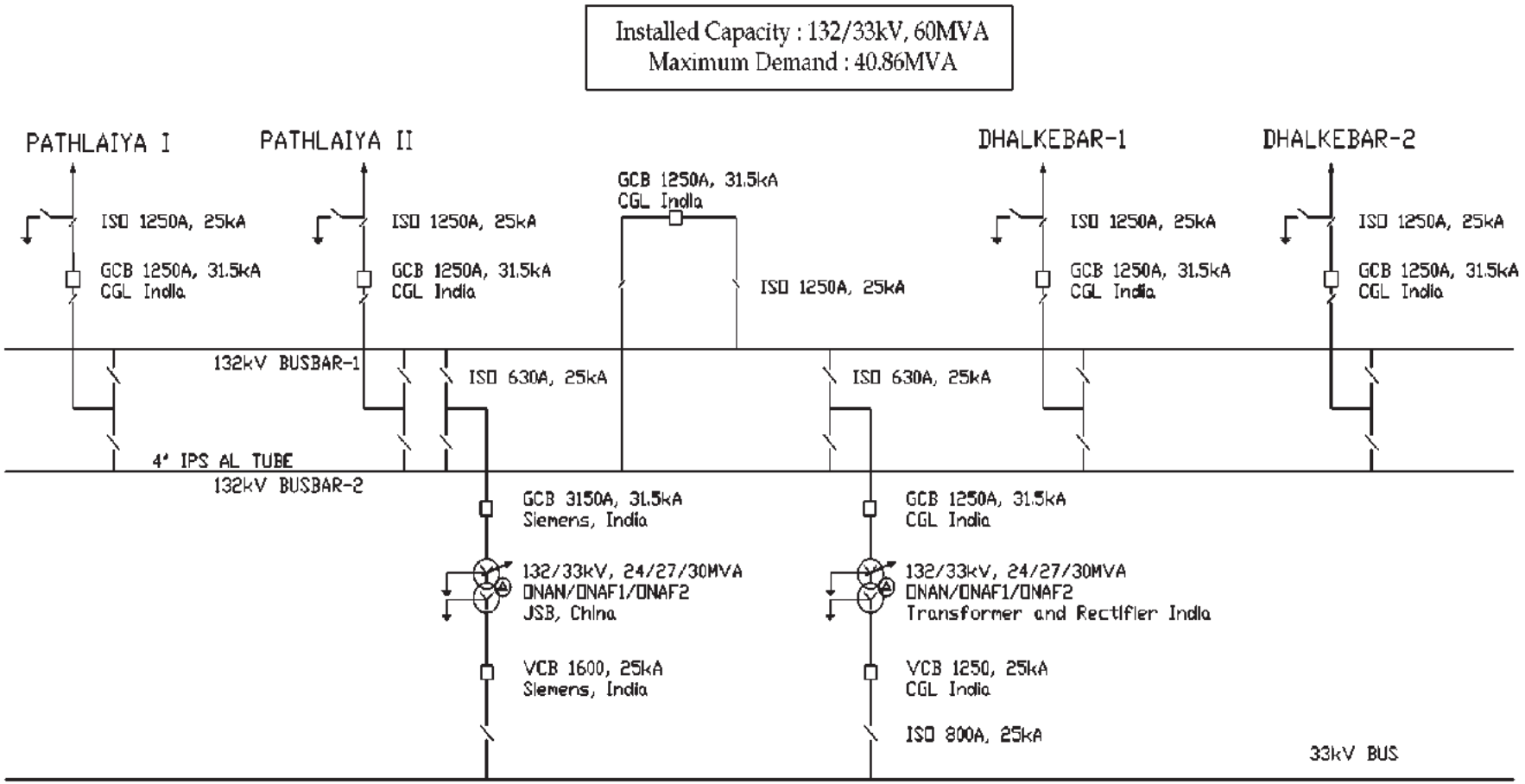
11. DHALKEBAR SUBSTATION

Dhalkebar substation with Double Bus System located at Dhalkebar of Dhanusha district, Janakpur zone feeds power to Janakpur, Sindhuli, Malangwa, Mahendranagar, Godar and Lalghad. Dhalkebar Substation is connected with Chandranigahpur and Lahan Sustation through Double Circuit 132kV lines. Dhalkebar Substation was initially commissioned in 1984 with 132/33/11kV, 10MVA capacity. Later the substation was upgraded by addition of 132/33kV, 15MVA Transformer in 1999. Again in 2001 the existing 10MVA Transformer was replaced by 15MVA Transformer which was again upgraded to 30MVA Transformer in 2003. Existing 132/33kV, 15MVA Transformer was replaced by 30MVA Power Transformer in 2010. In 2017 the existing 20MVA was further upgraded to 63MVA making the total capacity of the Substation to 93MVA. The 132kV incomer of the 220/132kV Substation at was also connected in this Substation.



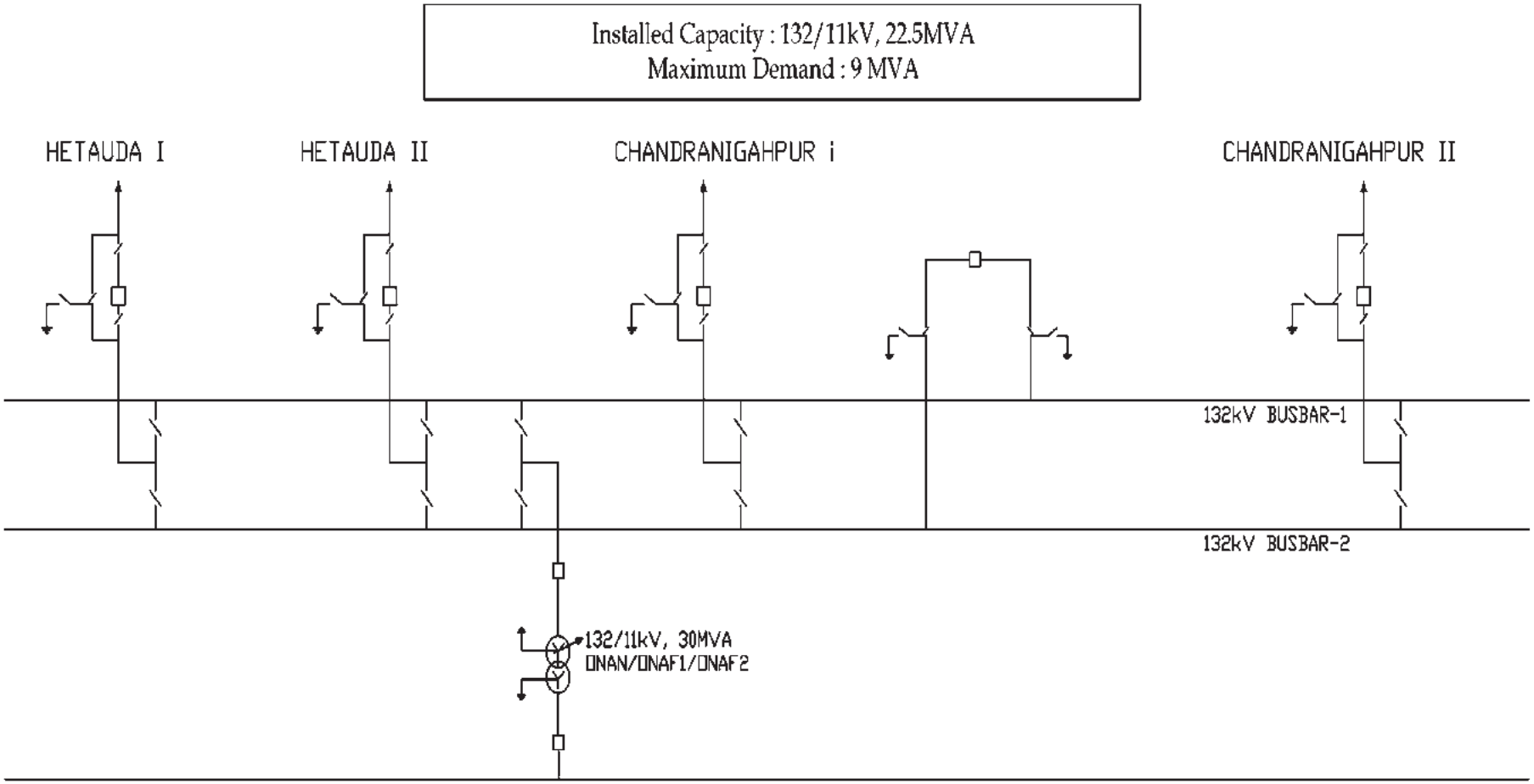
12. CHANDRANIGAHPUR SUBSTATION

Chandranigahpur Substation with Double Bus System located at Chandranigahpur of Rautahat district, Narayani zone feeds power to Haripur, Gaur, Nizgad and Malangwa. Chandranigahpur Substation is connected with Dhalkebar Sustation and Pathlaiya Substation through Double Circuit 132kV line. Chandranigahpur Substation was commissioned in 2008 with 132/33/11kV, 30MVA capacity. The Substation was further upgraded by addition of new 132/33kV, 30MVA Transformer Bay.



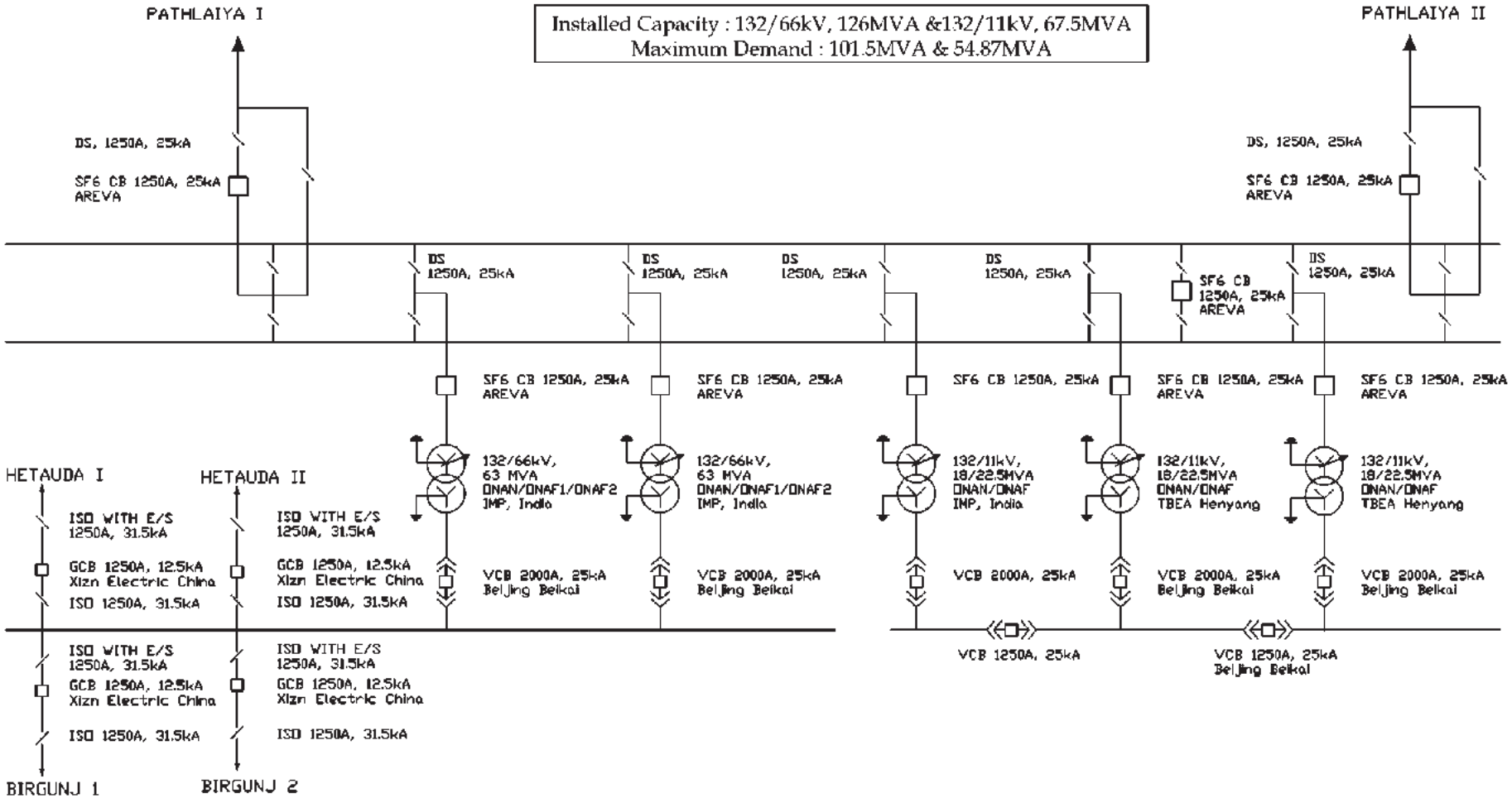
13. PATHLAIYA SUBSTATION

Pathlaiya Substation with Double Bus System located at Piluwa of Bara district, Narayani zone feeds power to Pathlaiya, Piluwa and Badhaharwa. Pathlaiya Substation is connected with Hetauda and Chandranigahpur Substation through 132kV Lines. Pathlaiya Substation was commissioned in 2012 with one no. of 132/11kV, 22.5MVA capacity.



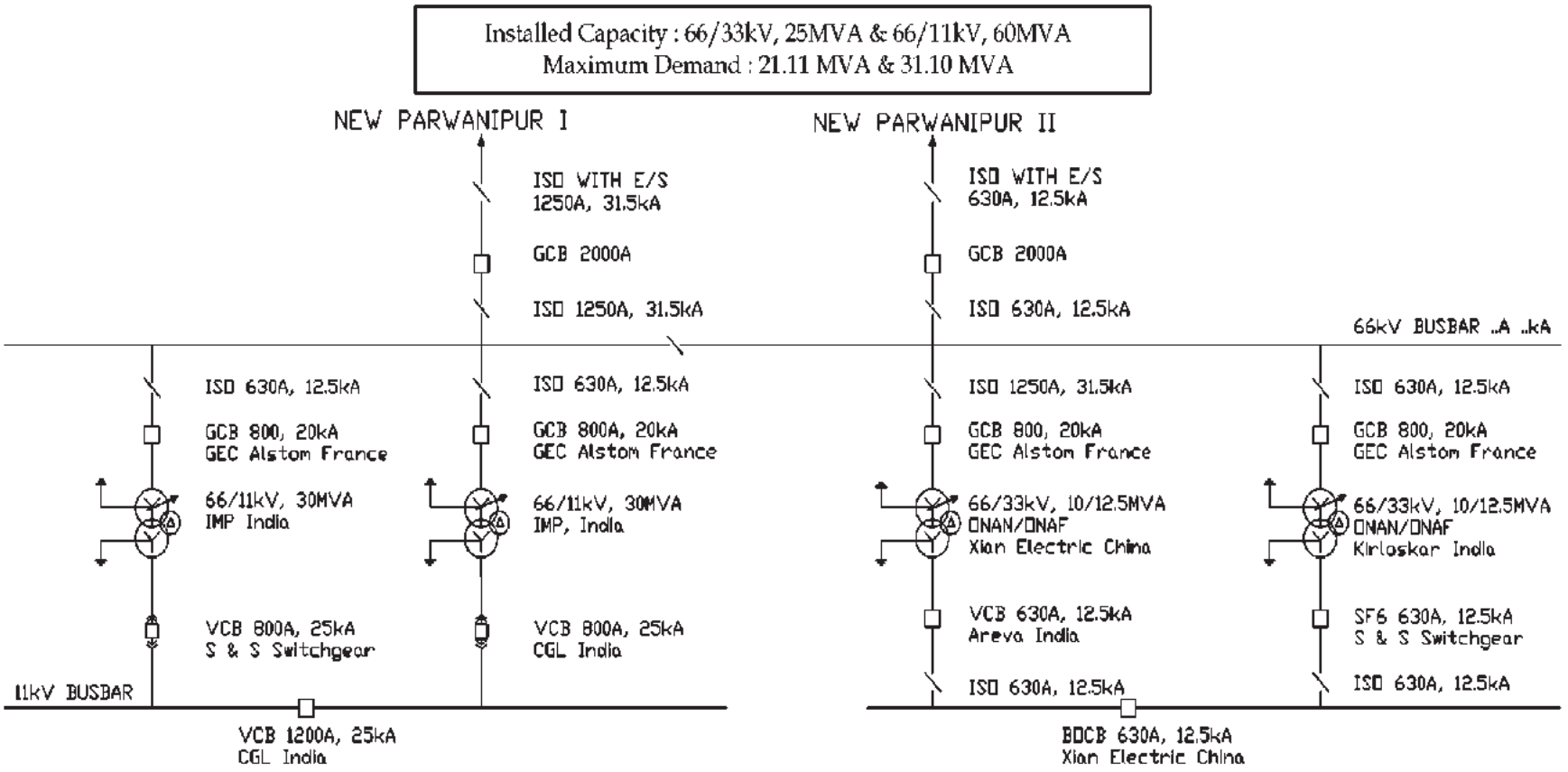
14. NEW PARWANIPUR SUBSTATION

New Parwanipur Substation with Double Bus System located at Parwanipur of Parsa district, Narayani zone feeds power to Jitpur, Parwanipur, Nitanpur and Birgunj. New Parwanipur Substation is connected with Chandranigahpur and Hetauda Substation through 132kV Lines. New Parwanipur Substation was commissioned in 2007 with two nos of 132/11kV, 22.5MVA capacity. 66/11kV Old Parwanipur Substation was replaced by 132/11kV New Parwanipur Substation. 132/66kV, 45MVA interconnection Power Transformer was commissioned in the begining of F/Y 2008/09 and a new 132/66kV, 45MVA Bay was added in 2012 . Further the 132/33kV, 2x45MVA was upgraded to 2x63MVA in the year 2015. Similarly, a new 132/11kV, 22.5MVA Transformer Bay was added in 2015.



15. BIRGUNJ SUBSTATION

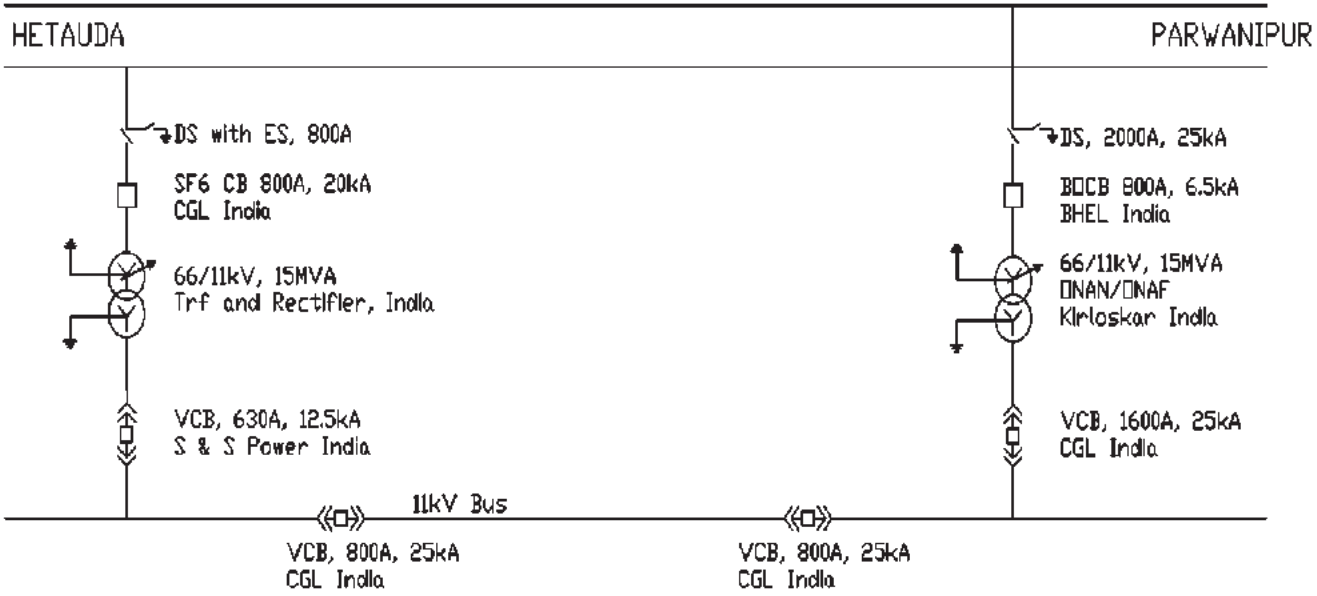
Birgunj substation located at Birgunj Sub metropolitan city of Parsa district, Narayani zone feeds power to Pokhariya, Raxaul, Kalaiya and Birgunj city. Birgunj substation is connected with Hetauda substation through 66kV Double Circuit Transmission Line. Birgunj Substation was commissioned in 1972 with 66/11kV, 1.5MVA capacity, which was later upgraded to 6MVA.. In 1989 the new Transformer Bay with two nos of 66/33kV, 12.5MVA was added in the existing system. The existing 6MVA Transformer was replaced in 2005 with two nos of 66/11kV, 7.5MVA capacity, which was further upgraded to two nos of 66/11kV, 15MVA capacity. Due to the severe voltage problem and the high demand of reactive VAR in this area a 33kV, 5MVAR and 11kV, 5MVAR Capacitor Banks has been placed. Due to increasing demand of industrial load this area is facing problems of low voltage so an additional 33kV, 10MVAR and 11kV, 10MVAR Capacitor Banks with new bay were installed in April 2009. Further the existing 66/11kV, 2x15MVA was upgraded to 2x30MVA in 2014.



16. SIMRA SUBSTATION

Simra Substation located at Simra of Bara district, Narayani zone feeds power to Jitpur, Simra, Dumarwana and Narwasti. Simra Substation receives power from Hetauda - Birgunj 66kV Double Circuit line through T - connection. Simra Substation was commissioned in 1972 with 66/11kV, 1.5MVA capacity. In 1993 the existing 1.5MVA Transformer was replaced by 66/11kV, 6MVA Transformer. Subsequently in 1995 the Substation was upgraded by addition of 66/11kV, 7.5MVA Transformer. Again in 2007 a New Transformer Bay with 66/11kV, 6.3MVA Transformer was added. In 2016 the existing 7.5MVA and 6.3 MVA Transformers were replace by 2x15MVA Transformers. 6MVA Transformer has been out of service since 2015.

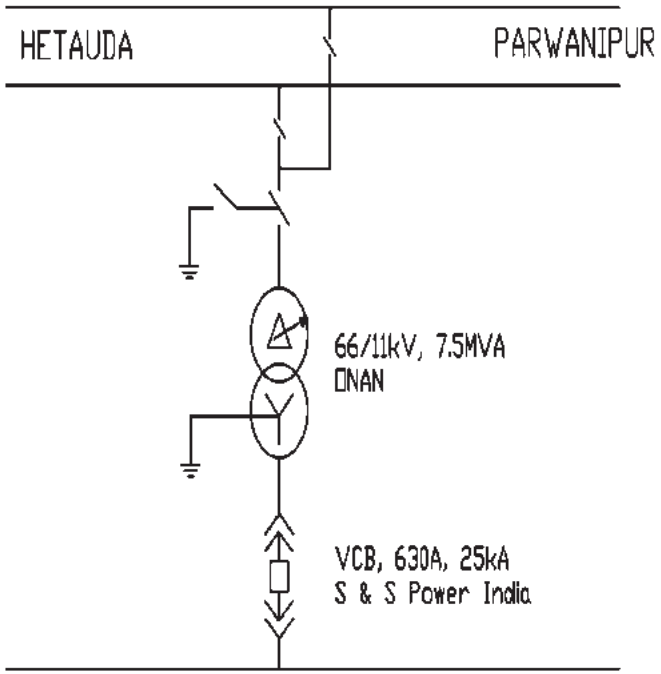
Installed Capacity : 66/11kV, 30MVA
Maximum Demand : 17 MVA



17. AMLEKHGUNJ SUBSTATION

Amlekhgunj Substation located at Amlekhgunj of Bara district, Narayani zone feeds power to Amlekhgunj area. Amlekhgunj Substation receives power from Hetauda - Birgunj 66kV Double Circuit line through T connection. Amlekhgunj Substation was commissioned in 1972 with 66/11kV, 1.5MVA capacity which was upgraded to 3.15MVA in 2005. Further the 31.15MVA Transformer was upgraded to 7.5MVA in 2017.

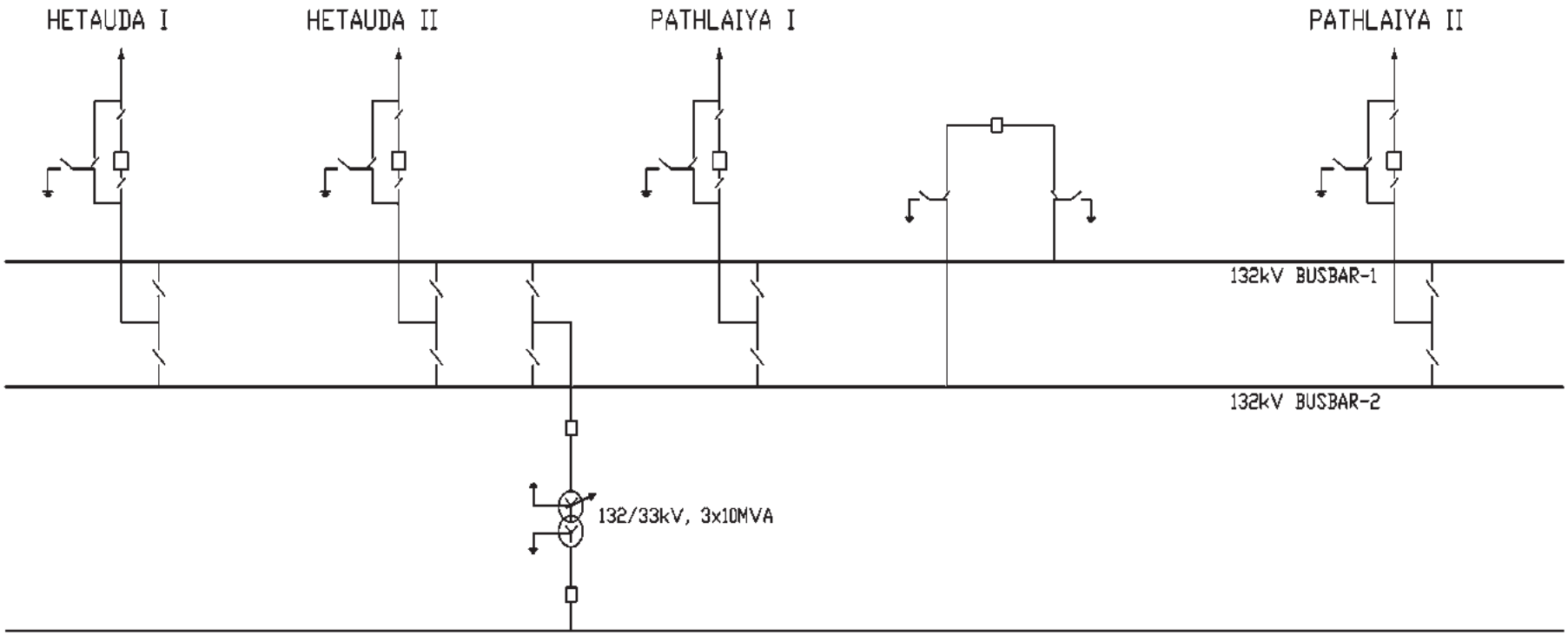
Installed Capacity : 66/11kV, 7.5MVA
Maximum Demand : 1MVA



18. KAMANE SUBSTATION

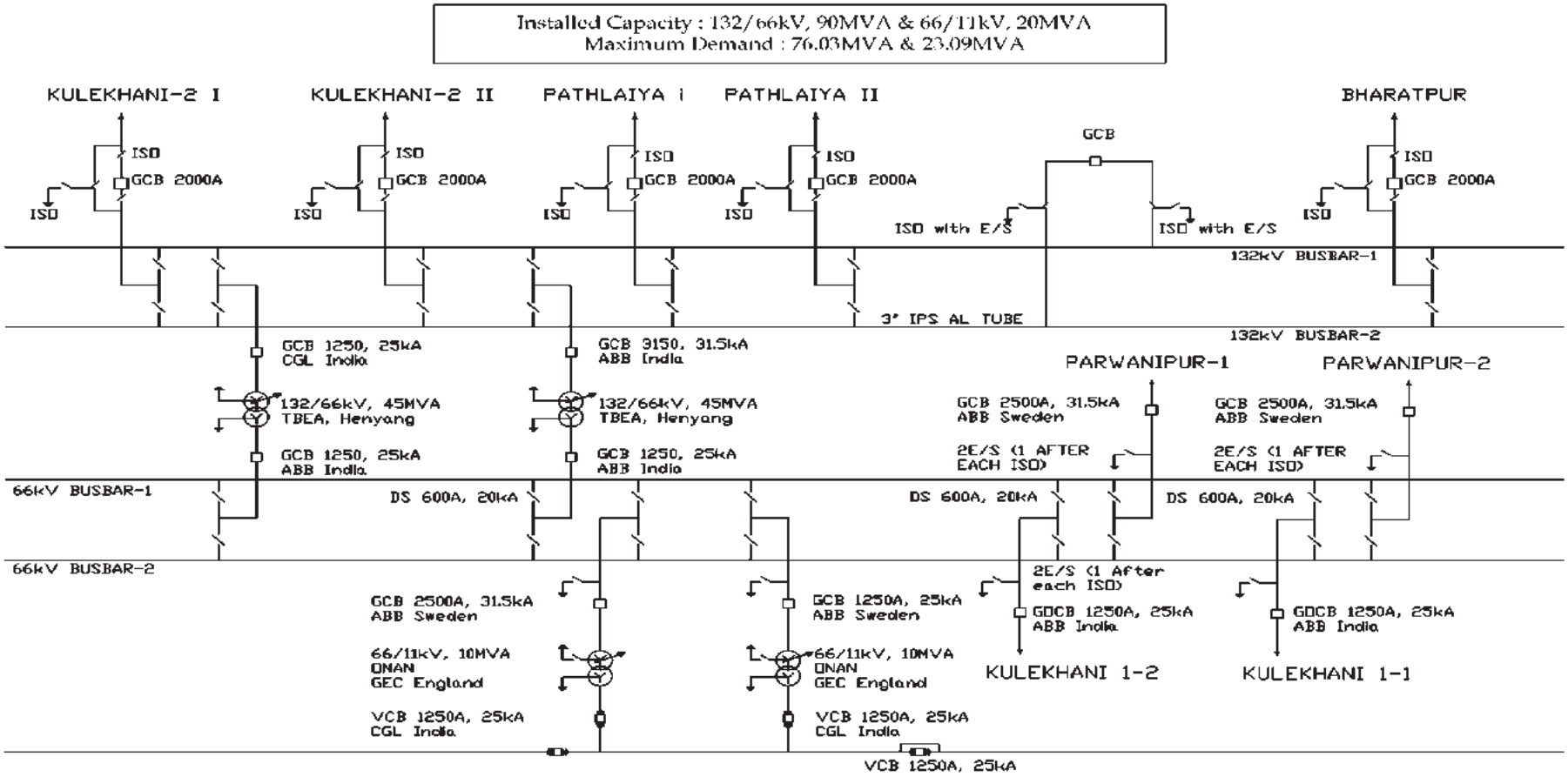
Kamane Substation with Double Bus System located at Kamane of Makwanpur district, Narayani zone feeds power to Shivam Cement and Hetauda Industrial District. Kamane Substation is connected with Hetauda and Pathlaiya Substation through 132kV Lines.Kamane Substation was commissioned in 2015 with one set of single phase 132/33kV, 3x10MVA capacity.

Installed Capacity : 132/33kV, 30MVA & 33/11 KV 16.6 MVA
Maximum Demand : 21.49 MVA & 5.72 MVA



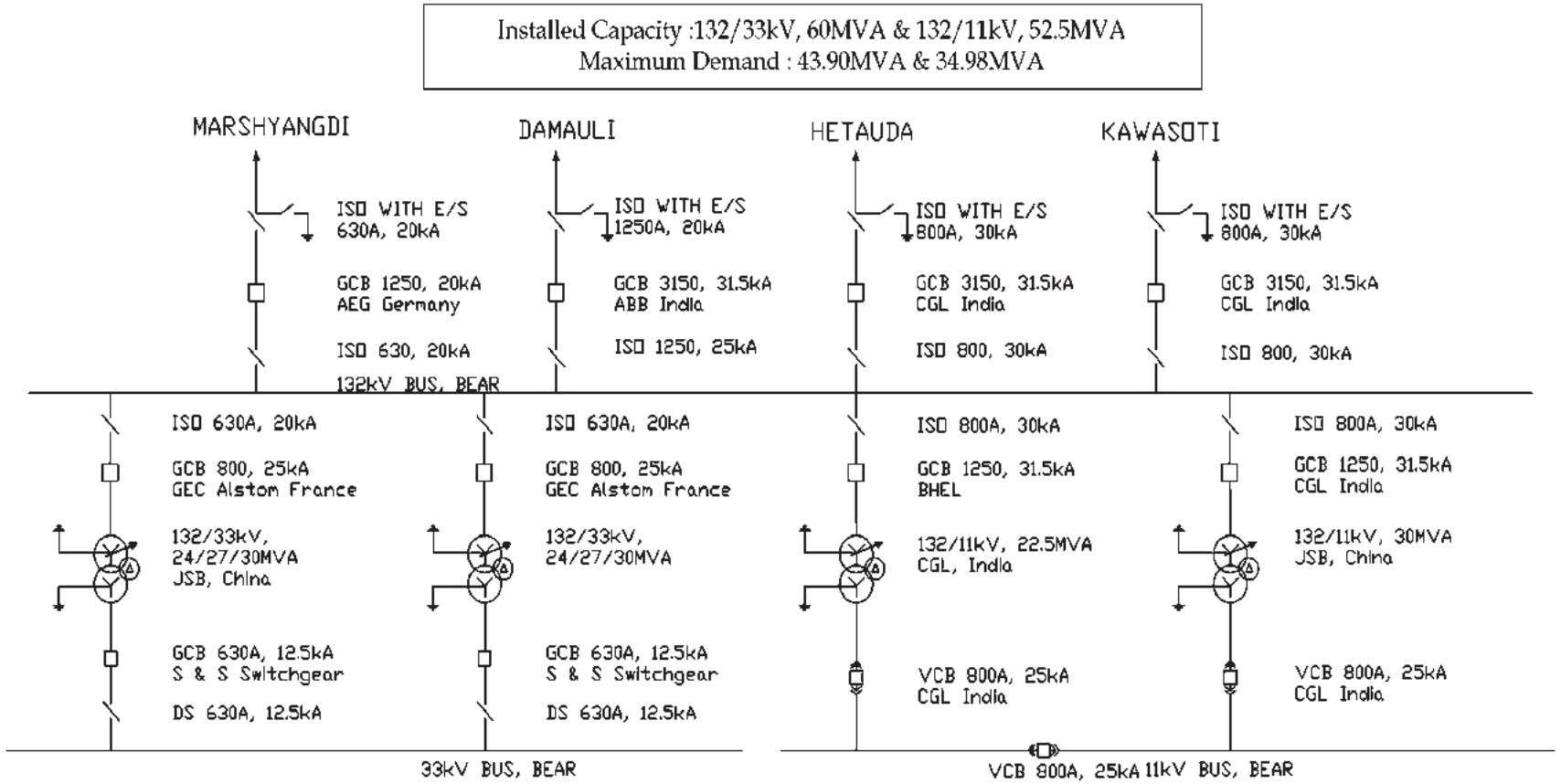
19. HETAUDA SUBSTATION

Hetauda Substation with Double Bus System in both 132kV and 66kV Voltage level located at Hetauda municipality of Makwanpur district, Narayani zone feeds power to Chaughada, IIID and Bhainse. Hetauda Substation is fed by Kulekhani II Power House through 132kV Single Circuit Line and Kulekhani I Power House through 66kV Double Circuit Line. Hetauda Substation is also fed by Hetauda Diesel Plant through 11kV System. Hetauda Substation is connected to New Parwanipur, Chandranigahpur and Bharatpur through 132kV Lines. Hetauda Substation is also connected to Birgunj Substation through 66kV Double Circuit Line along with some Bulk Consumers in the Birgunj Corridor. Hetauda Substation was commissioned in 1972 with 66/11kV, 1.5MVA capacity. The substation was upgraded with 132/11kV, 3 x 3.35MVA capacity in 1984 and later with 132/66kV, 20MVA. In 1985, 132 kV Dhalkebar I bay was added. In 1989, 132kV Kulekhani II was connected with the Substation. To cope with the increasing demand new 132/66kV, 20MVA Transformer with New Transformer Bay was added in 1999. In 2002, New 132kV Dhalkebar II line was added to the Substation. Further the existing two 66/11kV, 6MVA Transformerswas replaced by two 10MVA Transformers by 2009. The existing $\frac{132}{66}$kV, 2x20MVA was further upgraded to 2x45MVA in 2015.



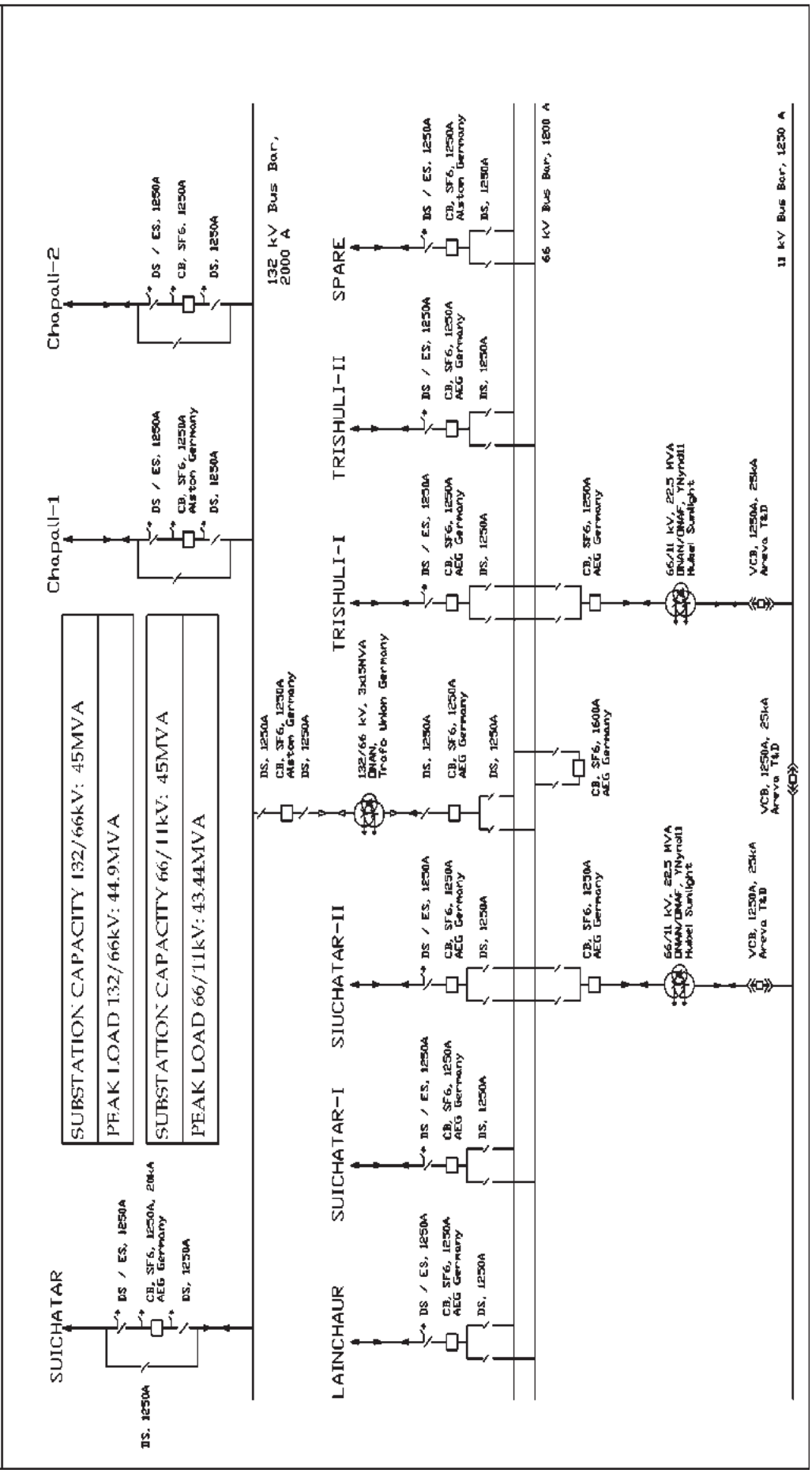
20. BHARATPUR SUBSTATION

Bharatpur Substation located at Bharatpur of Chitwan district, Narayani zone feeds power to Kawasoti, Parsa, Chanauli, Narayanghat, Bharatpur and Gaidakot. Bharatpur Substation is fed by Marshyngdi Power House through 132kV Single Circuit Line. Bharatpur Substation is connected with Damauli, Hetauda and Bardghat Substations through 132kV Single Circuit Lines. Bharatpur Substation was commissioned in 1979 with 132/11kV, 3 x 3.35MVA capacity. The Substation capacity was upgraded by addition of 132/66kV, 3x3.35MVA and 66/11kV, 6.3MVA Transformers in cascade. The Substation was upgraded in 1995 with the addition of 132/33kV, 15MVA Transformer with New Transformer Bay and three 33kV Line Bays supplying to 33kV Kawasoti, Parsa, Chanauli Substations. The 132/33kV, 15MVA Transformer was replaced by 132/33kV, 30MVA Transformer in 2000 and 132/66kV and 66/11kV Transformers was replaced by 132/11kV, 15MVA Transformer in 2004. Further 132/11kV, 22.5MVA Transformer Bay was added in 2011. Again 132/33kV, 30MVA Transformer Bay was added in 2017.



21. BALAJU SUBSTATION

Balaju Substation with Single Circuit located at the Balaju of Kathmandu district, Bagmati zone feeds power to Nagarjuna, Swayambhu, Maharajgunj, Bishnumati, BID, Nayabazar and Dharmasthali. This substation is connected to Siuchatar with 132 Single Circuit & Chapali Substation with 132kV Double Circuit Transmission Line. It is also linked with Lainchaur Substation by 66kV Single Circuit and Siuchatar Substation by double circuit 66kV Transmission System. Trishuli Power Plant to this Substation with Double Circuit and to contribute in load demand of Kathmandu Valley. This Substation was built with two numbers of 66/11kV, 3x3.75MVA Capacity in the year 1967 along with construction of Trishuli Power House. Addition of 132kV Transformer Bay with 3x15MVA Capacity, 132kV single Bay for Siuchatar, double 66kV line bays for Siuchatar, single 66kV Bay for Lainchaur and replacement of old 66/11 Transformer with new 2x10MVA Power Transformer were augumented with complete GIS system in the Year 1989. In 2009 the two 66/11kV, 10MVA Transformers were replaced by new 22.5MVA Transformers. In 2017 Construction of Chapali 132kV Bay for evacuating Power of Khimti and Bhotekoshi was carried out .

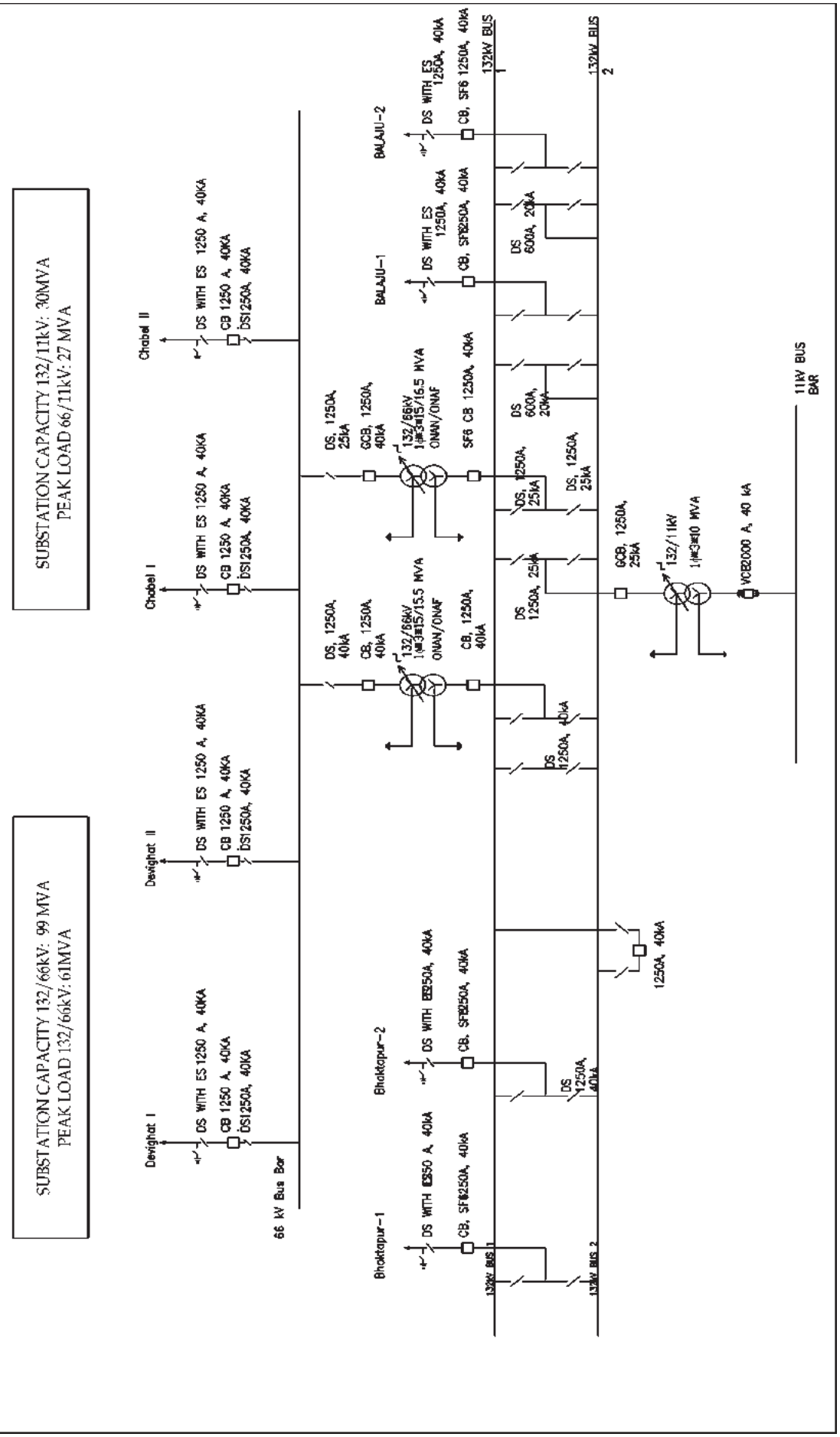


22. CHAPALI SUBSTATION

Chapali Substation having double bus system at 132 kV and single Bus System at 66kV voltage level located at Chapali , near Budanilkantha of Kathmandu district. This Substation was constructed with 132 kV double Busbar System to connect with Balaju and Bhaktapur. Two number of 66kV Bay for Devighat Circuit-I &II and two number of bays for 66 kVChabel-I and II circuit. It has 2 Set of 132/66 kV Singe Phase Transformer having Capacity of 3x15/16.5 MV There are one set of single phase Transformer with Capacity 3x10 MVA .

SUBSTATION CAPACITY 132/66kV: 99 MVA
PEAK LOAD 132/66kV: 61MVA

SUBSTATION CAPACITY 132/11kV: 30MVA
PEAK LOAD 66/11kV: 27 MVA

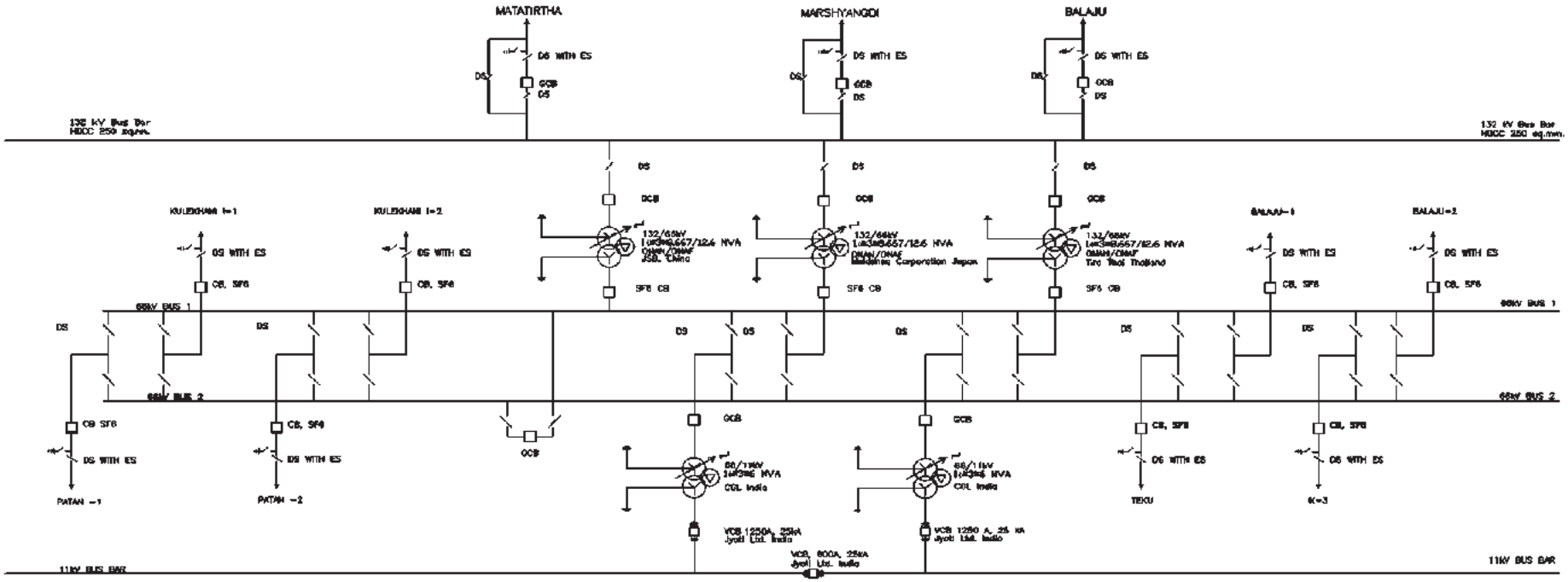


23. SIUCHATAR SUBSTATION

Siuchatar Substation having double bus system at 66kV and single Bus System at 132kV voltage level located at Siuchatar, near Kalanki of Kathmandu district feeds power to Teku, Kalimati, Kalanki, Swayambhu, Thankot, Balambu and Tahachal. This Substation was constructed with 66kV double Busbar System to connect with Balaju and Hetauda Substation in 1966. One number of 66kV Bay for Patan Circuit-I and two number of bays for 66/11kV Transformer with Capacity 3x6MVA were constructed with grant aid of Japanese Government . During construction of Kulekhani-II Power House, one 66kV bay for Kulekhani-II and one 66kV bay for Transformer with Capacity 3x8.667/12.6MVA was constructed in 1979 with Japanese grant. This substation was upgraded in 1984 with addition of three 132kV line bays (Kulekhani-II, Balaju and Marshyangdi) and one Transformer bay for 132/66kV, 3 x 12.6MVA Transformer. Similarly Kathmandu Valley Reinforcement Project had constructed 66kV Line Bays for Patan-II and Teku along with 132kV Bays in 1984. Interconnection of Siuchatar Substation with K3 Substion by 66kV Power Cable was completed in 2004 with grant aid of Japanese Government. Grid Substation Re-inforcement project has recently added one 132/66kV Transformer Bay with Capacity 3x8.667/12.6MVA to upgrade Transformation capability of the Substation in 2008. Office Complex of System Operation Department along with Load Dispatch Centre is located within this Substation area.

SUBSTATION CAPACITY 132/66kV: 113.4MVA
PEAK LOAD 132/66kV: 113.16MVA

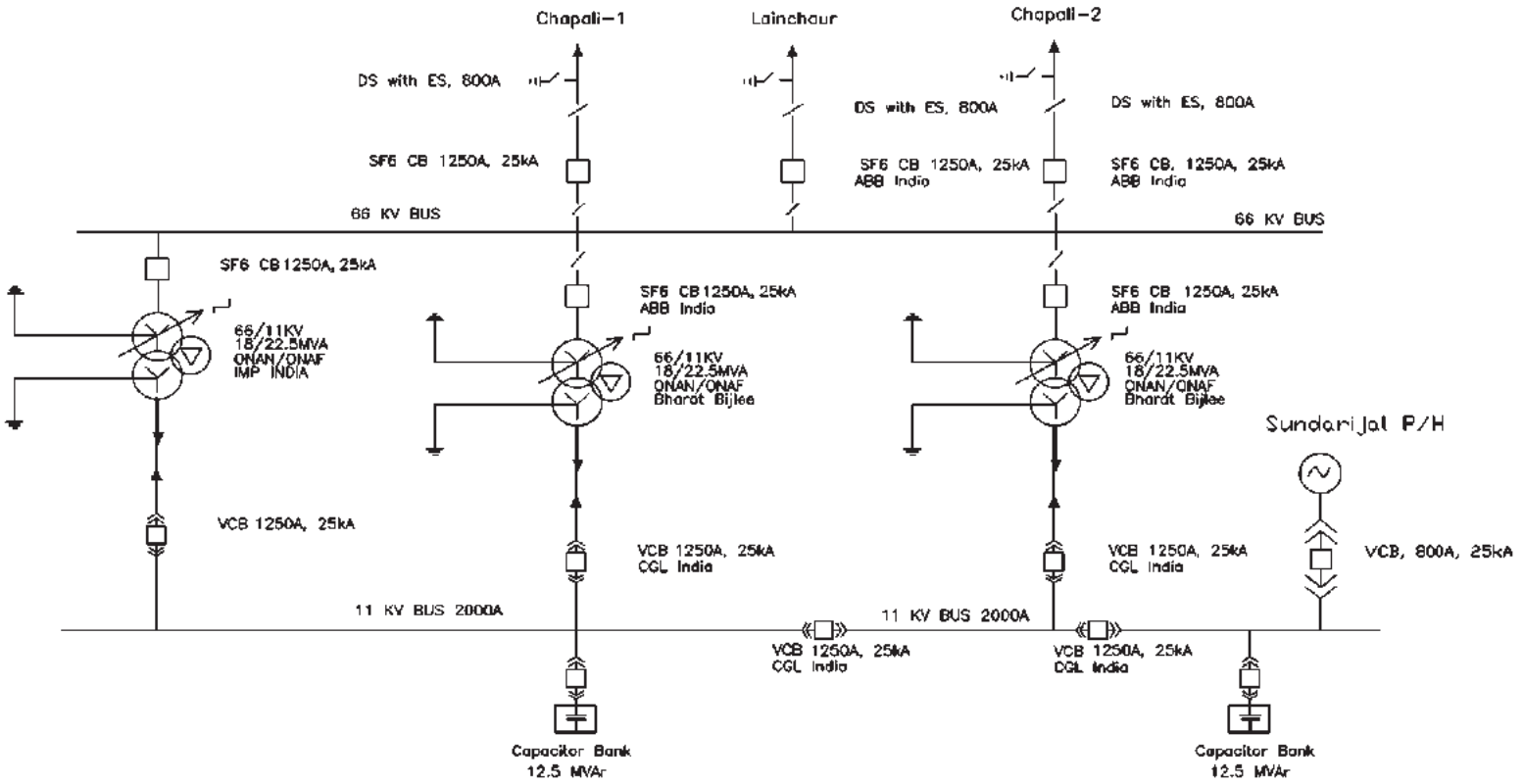
SUBSTATION CAPACITY 66/11kV: 36MVA
PEAK LOAD 66/11kV: 25.15MVA



24. NEW CHABEL SUBSTATION

Chabel substation with Single Busbar System located at Chabel of Kathmandu district feeds power to Om Hospital, Sankhu, Maharajgunj Chabel, Mahankal and Sundarijal. This Substation was built in the year 1982 with three 66kV Transformer bays of 66/11kV, 6.3 MVA capacity and two 66kV line bays to evacuate power from Devighat Power Plant. Out of two circuits, one circuit was diverted to Bhaktapur and new 66kV line was constructed from Chabel to Bhaktapur in the Year 1995. Old 12kV OCB Swichgears were replaced with 12kV VCB Switchgears in FY 2001. With the increased load, three numbers of 66/11kV, 6.3MVA Power Transformers were replace by two numbers of 66/11kV, 22.5MVA capacity in the year 2003. Another 22.5MVA Transformer Bay was added in the year 2013. Now, There are Three numbers of 66/11 kV 22.5MVA Power Transformers.

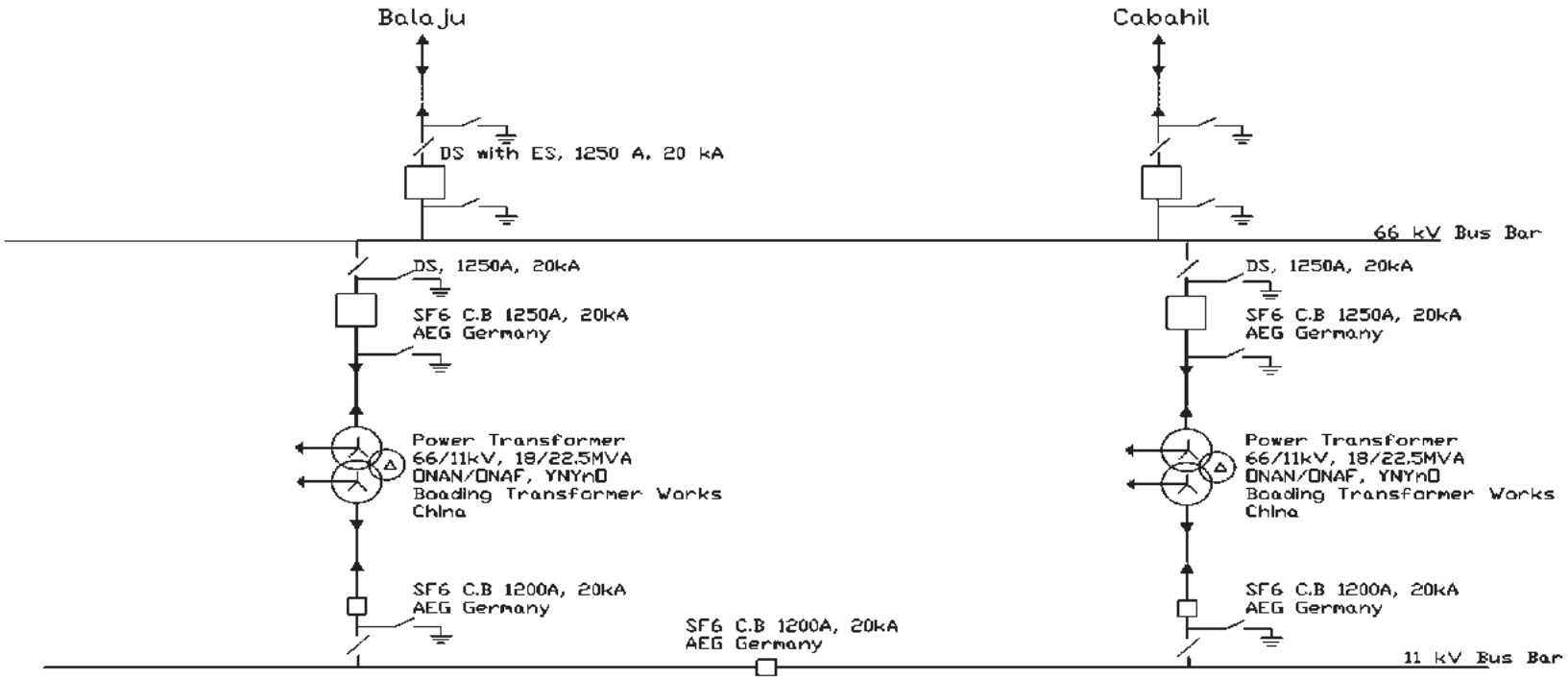
SUBSTATION CAPACITY:67.5MVA
PEAK LOAD: 47.66 MVA



25. LAINCHAUR SUBSTATION

Lainchaur Substation with Single Busbar Sytem located at Lainchaur, Kathmandu feeds power to Keshar Mahal, Samakhusi, Lazimpat, Gairidhara, Kingsway, Thamel, Royal Palace and K2 switching station. This GIS Substation was built in the year 1989 with two numbers of 66/11kV, 10MVA capacity with the grant aid of German Government. After an accident occured, indoor 12kV Vacuum type Switchgears were temporarily commissioned on July 1990 to supply the emergency loads. Ater 3 years of operation 12 kV VCB Switchgears were replaced with GIS system. In the year 1996, two numbers of 66/11kV, 10MVA Power Transformers were shifted to Bhaktapur Substation whereas two numbers of 66/11kV, 22.5MVA new Transformers were installed in Lainchaur Substation by Kathmandu Valley Reinforcement Project, NEA.

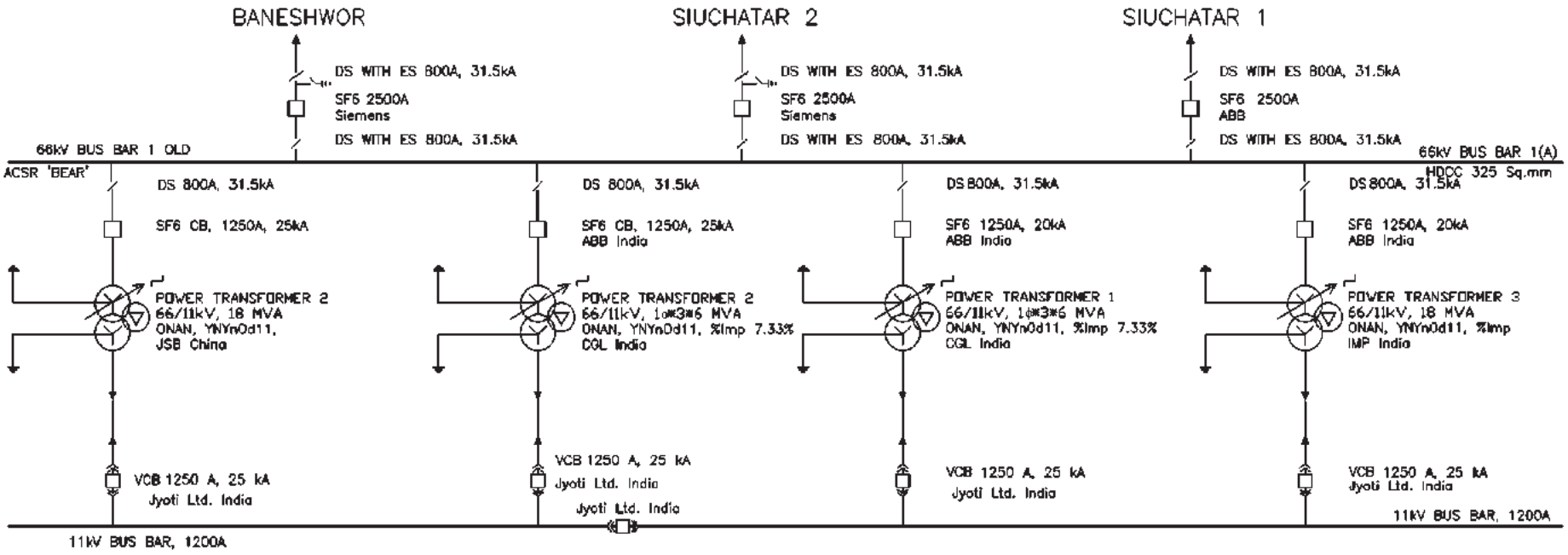
SUBSTATION CAPACITY: 45MVA
PEAK LOAD 132/66kV: 48.93MVA; 132/11kV: 36.58MVA



26. PATAN SUBSTATION

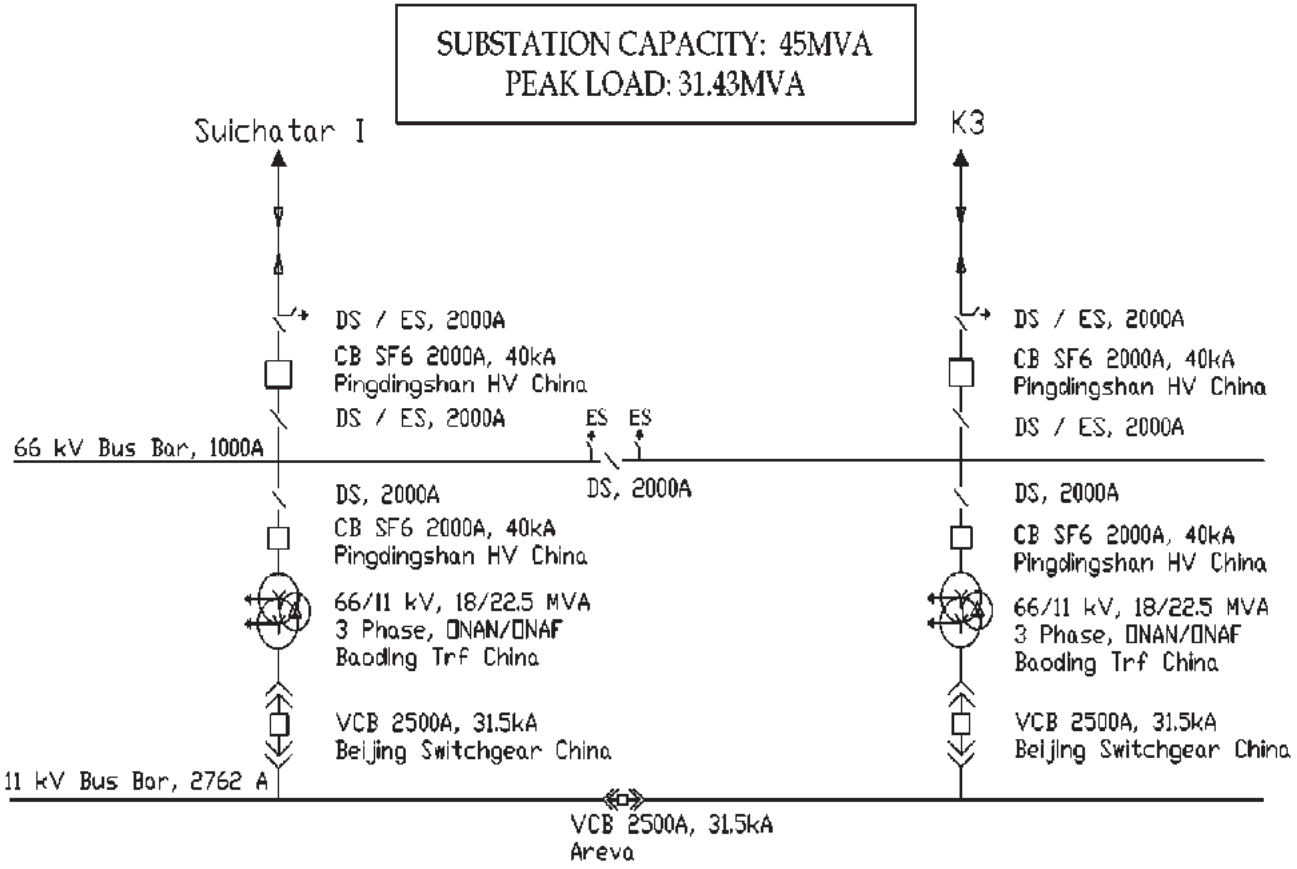
Patan Substation with Single Busbar System located near Patan Hospital at Lagankhel of Lalitpur district is connected through 11kV Ring Main with Thimi, K3, Teku and Old Patan Substations. When Kulekhani-I, 60MW Power Plant was under construction, 66kV single circuit Line (SIUCHATAR-1) and 66/11kV Transformer Bays with two numbers of Transformer capacity 3x6MVA were commissioned in the year 1979. Old 12kV BOCBs were replaced with 12kV VCB Switchgears with the grant aid of Japanese Government in the Year 1994. To upgrade the Power Transfer capacity in 66kV System, 66kV Line Bays for 66kV Baneshwor Line and 66kV Suichatar-II Line were added by Kathmandu Valley Reinforcement Project during the year 1997. New 66/11kV, 18MVA Transformer Bay was added in 2014. The substation was further upgraded with the addition of new 66/11kV, 18MVA Bay in 2018.

SUBSTATION CAPACITY: 72MVA
PEAK LOAD : 54MVA



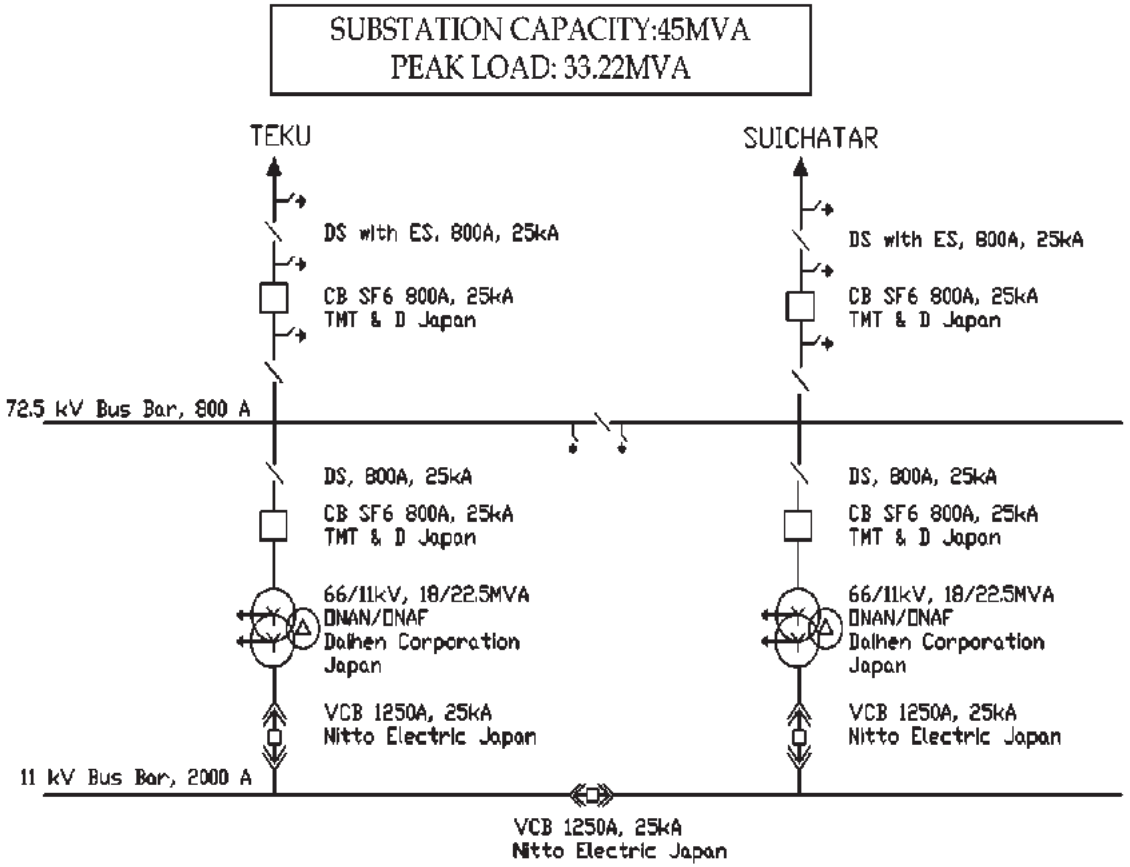
27. TEKU SUBSTATION

Teku Substation located with Single Bus System in Teku, Kathmandu feeds power to Sundhara, Pulchowk, Thankot, Kirtipur, Tripureshwor, Thapathali, Bhimsensthan, Tahachal, Kalimati. This GIS Substation was built by Kathmandu Valley Reinforcement Project in 1995 with two numbers of 66/11kV bays of 18/22.5MVA capacity. 132kV Line Bay was constructed to link with Siuchatar Substation in the same period. With the grant of Japanese Government, one 66kV Line Bay was constructed and linked by 66kV Power Cable to K3 Substation in 2006.



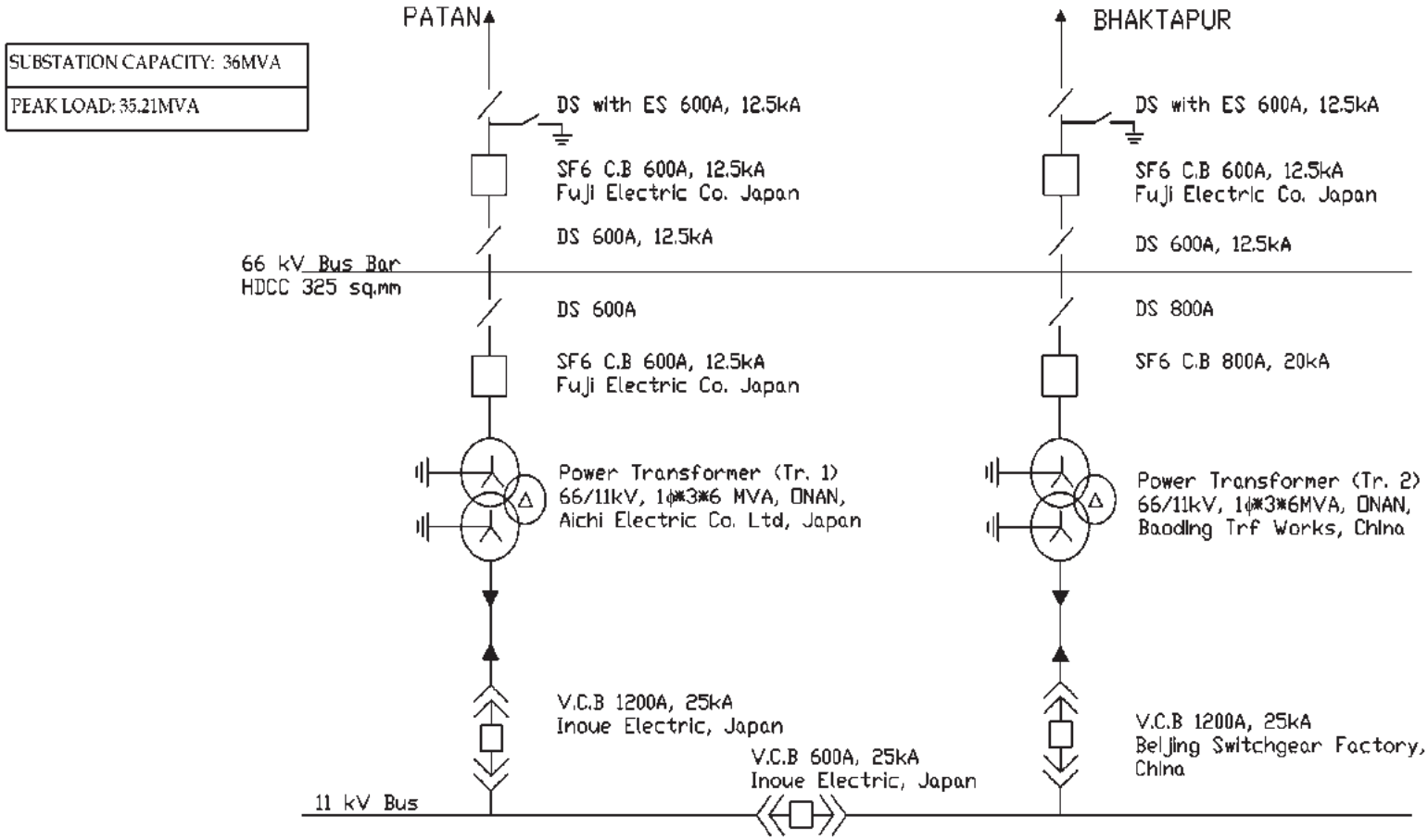
28. K-3 SUBSTATION

K3 substation with single Bus System located at Singhadurbar Area, Kathmandu feeds power to Bhrikutimandap, Putalisadak, Anamnagar, Singhadurbar, Kalikasthan and K2 switching Station. This GIS Substation was built in the year 2006 with two numbers of 66/11kV, 22.5MVA capacity, with the grant aid of Japanese Government. This 66/11kV Substation is interconnected with Teku Substation and Siuchatar Substation by 66kV under ground High Voltage Power Cable. Two numbers of 66/11kV, 22.5MVA Transformers under operation are sludgeless Transformers. Remote Control Panel with switching and metering facilities at 1st Floor for 15 numbers of 12kV VCB Switchgear Panels located at ground floor has been installed in year 2008.



29. BANESHWOR SUBSTATION

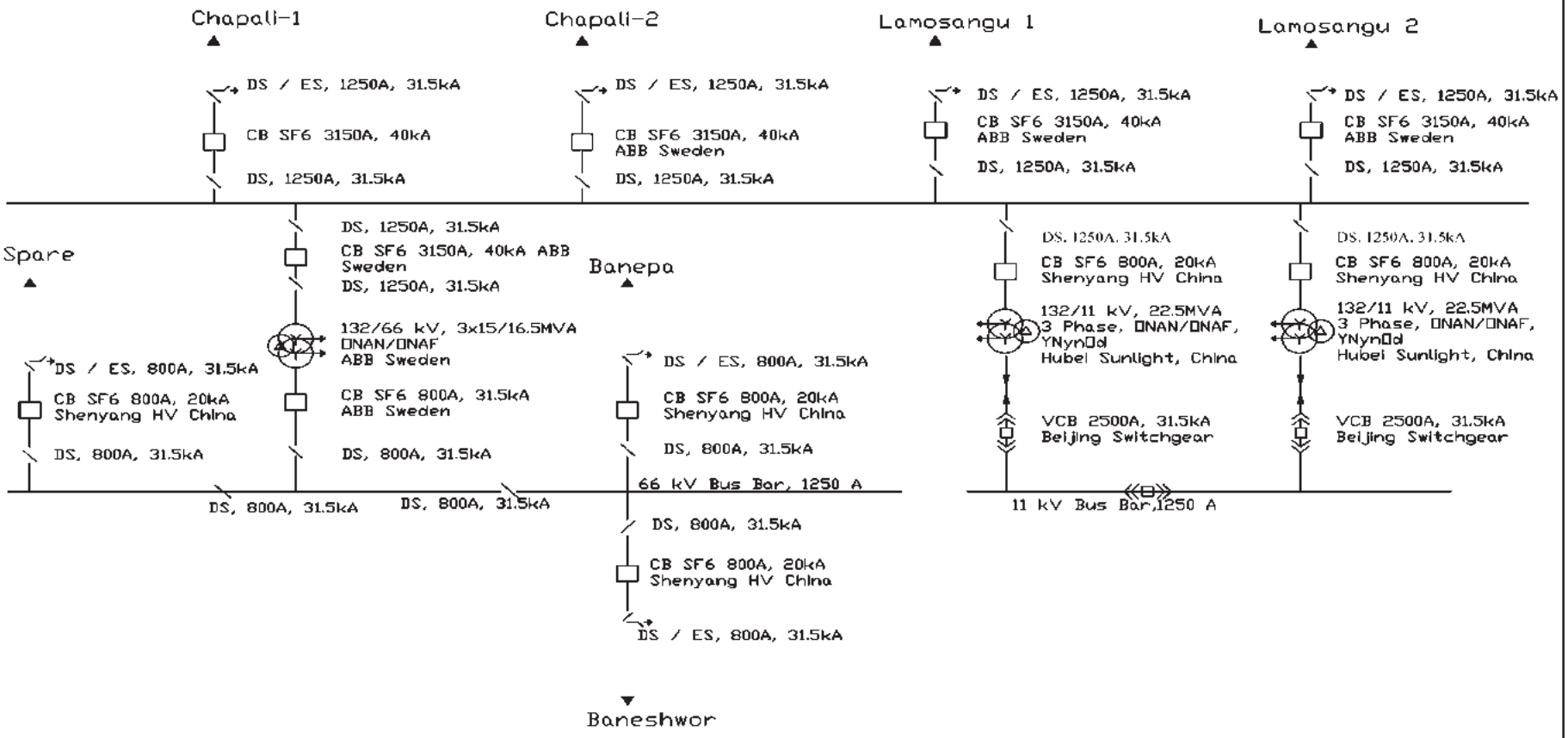
Baneshwor substation with Single Busbar System located at Min Bhawan of Kathmandu district, Bagmati zone feeds power to Gothatar, Sankhamul, IC Hall, Imadol, Lubhu, Airport, Baneshwor, Koteshwor, Bagmati and Dhobikhola. This substation is connected to Bhaktapur and Patan substation through 66kV Transmission line. This Substation was built in the year 1987 with the grant aid of Japan Government with single Bay of 66/11kV, three 6 MVA capacity. This substation was upgraded to two number of 66/11kV, 3 x 6MVA capacity with addition of new 66/11kV Transformer Bay by Kathmandu Valley Reinforcement Project with ADB Loan in the second phase, year 1996. 12kV Vacuum Switchgear Panels were installed in two tier System (one above other) due to limited space inside control Building. Office Building for Grid Operation Department and Kathmandu Grid Division is also located in this substation area.



30. BHAKTAPUR SUBSTATION

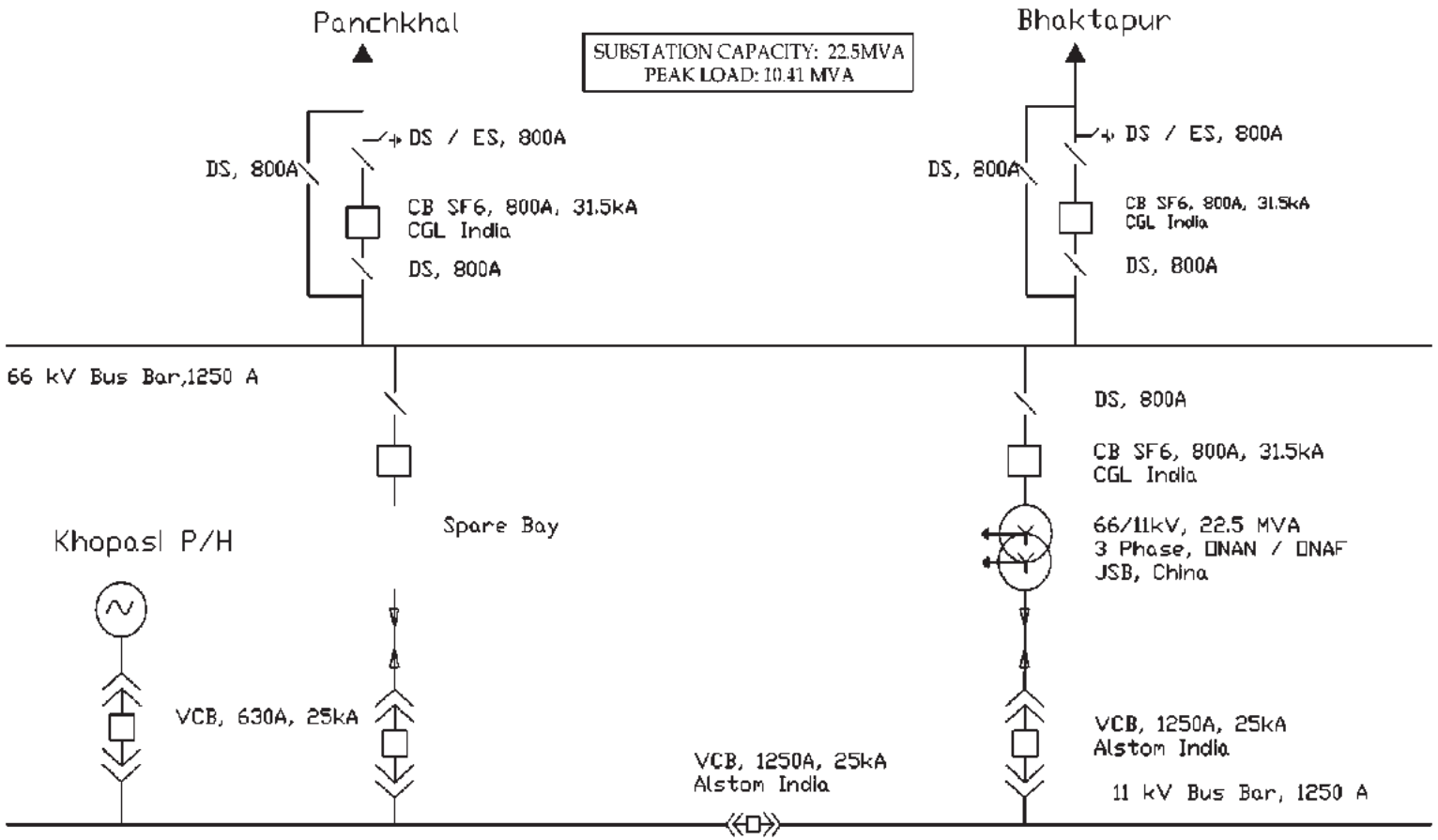
Bhaktapur Substation with Single Busbar System located near to Baktapur Industrial Area of Bhaktapur district, feeds power to Thimi, Nagarkot, Byasi, Katunje and Nalinchowk,Khopasi,BID,Bode,Brick. This Substation was constructed with 2 Transformer Bays in the year 1995 with 2 x 10 MVA Transformer shifted from Lainchaur Substation. To evacuate the Power from two IPPs (Khimti Hydro Power Project & Bhotekoshi Hydro Power Project), 132/66kV Substation with Capacity 3x15/16.5MVA was constructed in the year 1999 with the grant aid of Finnida. Now, There are Two number of 132/11kV Transformer Bays with capacity 22.5MVA each and 132/66 kV of 3x15/16.5 MVA.

SUBSTATION CAPACITY 132/66kV, 49.5MVA; 132/11kV,45 MVA
PEAK LOAD 132/66kV: 48.93MVA; 132/11kV: 36.58MVA



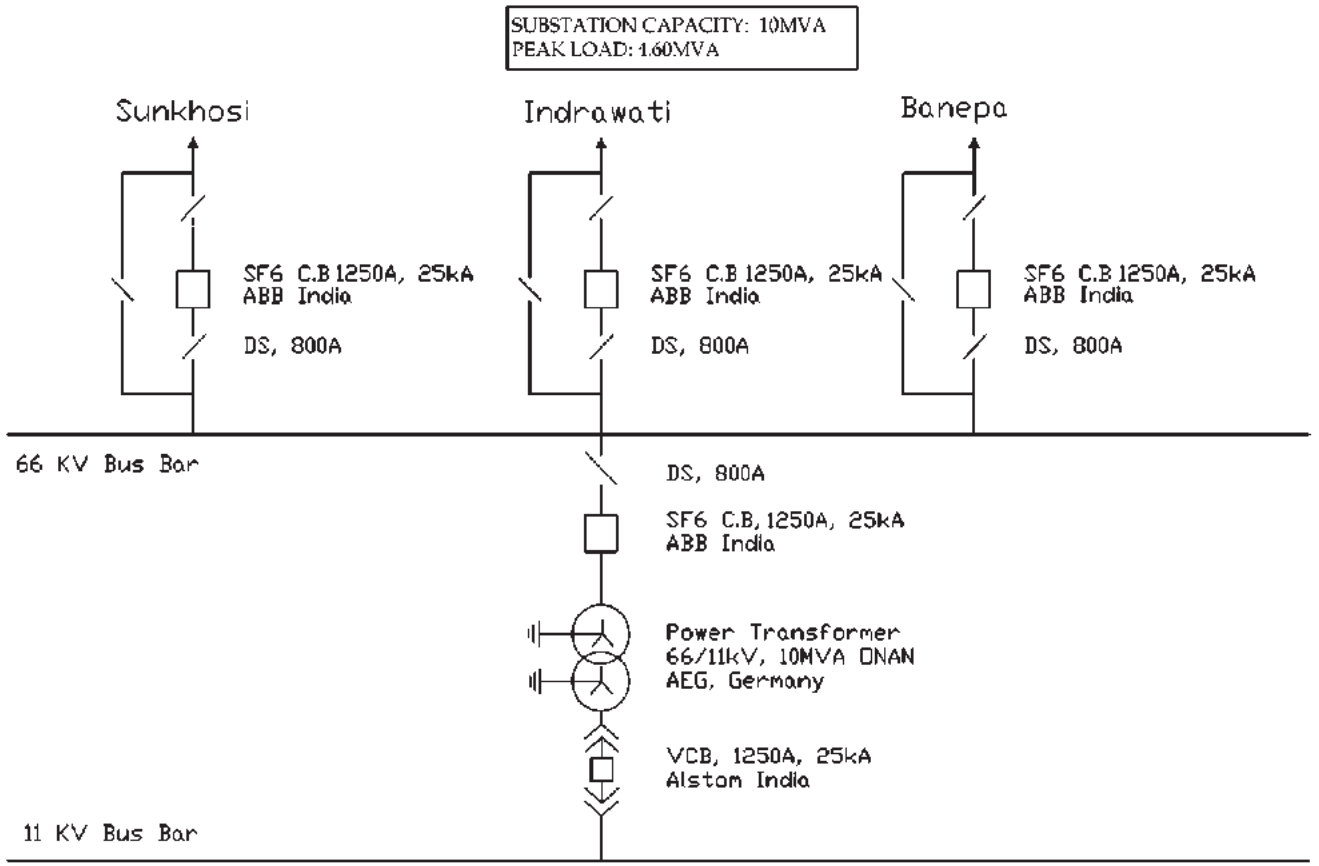
31. BANEPA SUBSTATION

Banepa Substation located at Bhurungkhel of Dhulikhel Municipality, Kavre feeds power to Banepa area, Panauti, Sanga, Khawa, Dhulikhel, and Nala. Initially Banepa area was fed from Bhaktapur-Khopasi 33kV Line and Nalinchowk 11kV Feeder originated from Bhaktapur Substation. To supply growing load of Banepa Area, new Substation was proposed at Banepa and was built in Year 2001 with 66/11kV, 10/12.5MVA capacity. Banepa Substation is also interconnected with Panauti Power House via 11kV Distribution line. 10MVA Transformer Bay was added in the year 2009. Further both the Transformers were upgraded to 2x22.5MVA in the year 2017. One of the 22.5MVA Transformer was later shifted to Balaju Substation.



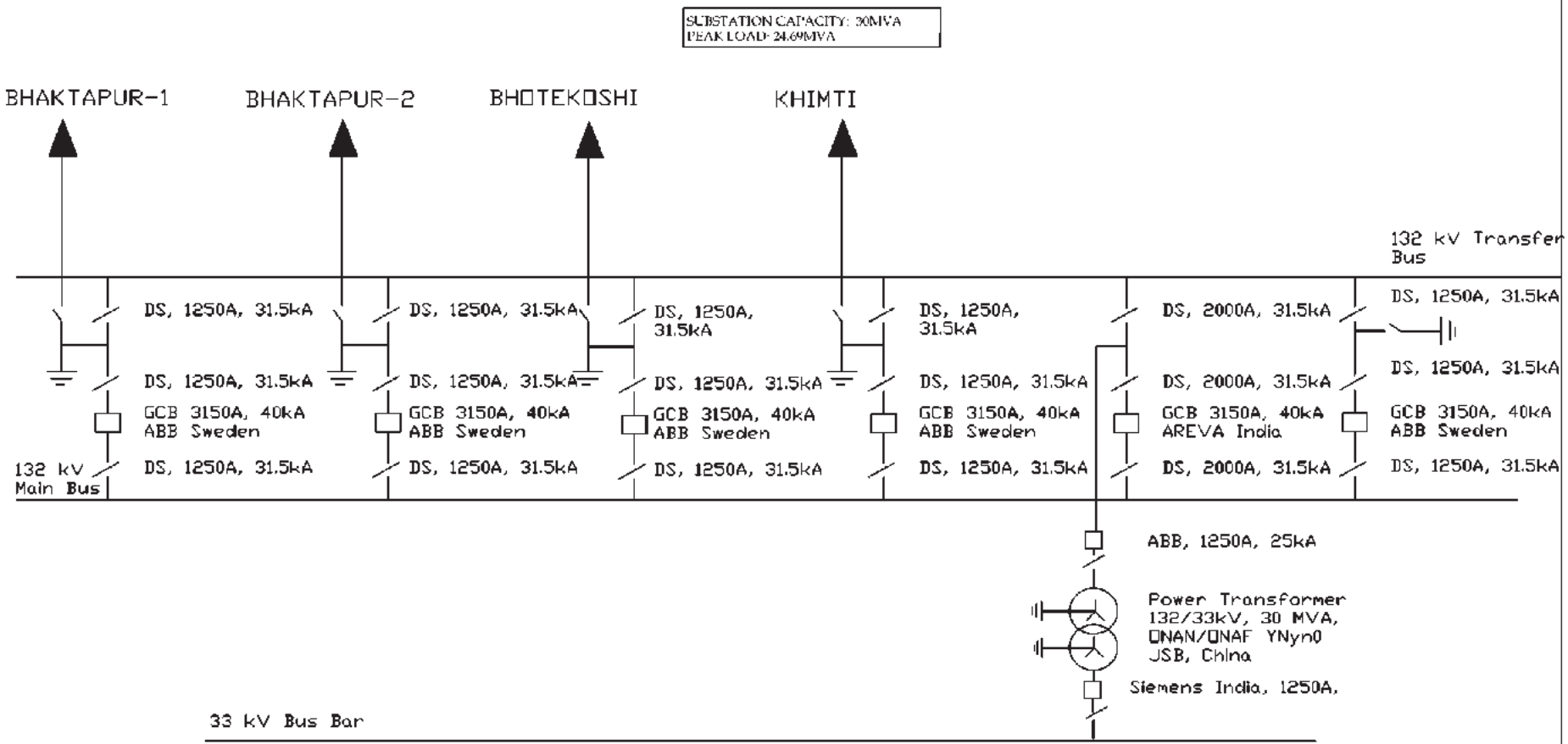
32. PAANCHKHAL SUBSTATION

Paanchkhal Substation located at Paanchkhal of Kavre District feeds power to Melamchi, Tinpiple, Paanchkhal and Palanchowk. Panchkhal Substation was connected in T-Mode with 66kV Bhaktapur- Sunkoshi Line in 1972 and was supplying local power through 66/11kV, 1.5MVA Transformer. During construction of Banepa Substation, Paanchkhal Substation was upgraded to 5MVA Capacity with new 66kV Bay in π -Connection in the Year 2003. 66kV C&R Panels along with new 12kV VCB Panels were installed in new Control Building. After commissioning of Indrawati-III Power Plant, built by IPP (National Hydro Power Company), the plant was interconnected with Paanchkhal Substation. The existing 5MVA Transformer was replaced by 10MVA in the year 2011 June.



33. LAMOSANGHU SUBSTATION

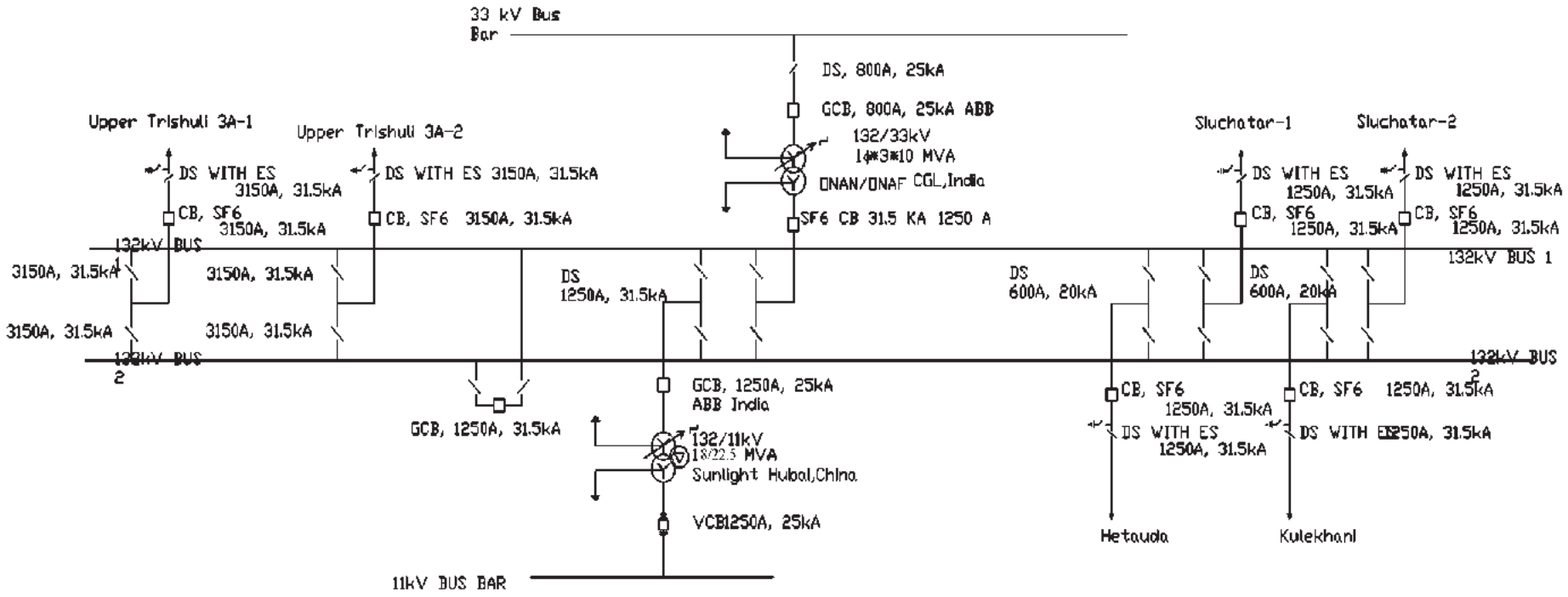
Lamasanghu Substation was a switching Substation located at Lamosanghu, near Sunkoshi Power House at Sindhupalchowk District. To evacuate the Power from 60MW Khimti Power Plant owned by one of the IPPs, Himal Power Limited and facilitate other upcoming power projects in the vicinity of Sunkoshi Corridor, this Substation was built in the year 1999 with the grant aid of Finnida. Most of the equipments are from the manufacturer ABB, Finland. This Substation was built with one Main Bus and one Transfer Bus having Three number of Line Bays (One Bay for Khimti Power Plant and Two Line Bays for Bhaktapur). One number of 132kV Line Bay for Bhotekoshi Power Plant owned by IPP for evacuating 36MW power was constructed in the Year 2002. To provide the connection points to the upcoming IPPs to evacuate power through 33kV System, Grid Operation Department iniatiated and built new 132/33kV, 15MVA Transformer Bay at Lamosanghu Substation in the Year 2008. The 15MVA Power Transformer was upgraded to 30MVA in 2012 for evacuating more Power from 33kV.



34. MATATIRTHA SUBSTATION

Matatritha Substation having double bus system at 132kV level located at Matatirtha, Western part of Kathmandu This Substation is connected with 132 kV double Busbar System to connect with Siuchatar with double circuit transmission line, Hetauda with Single Circuit Line, Kulekhani Powerhouse with single circuit line and upper Trushuli 3A power house with Double Circuit. There are two number of Power Transformers one of 132/11 kV,22.5 MVA and other 132/33 kV,3x10 MVA

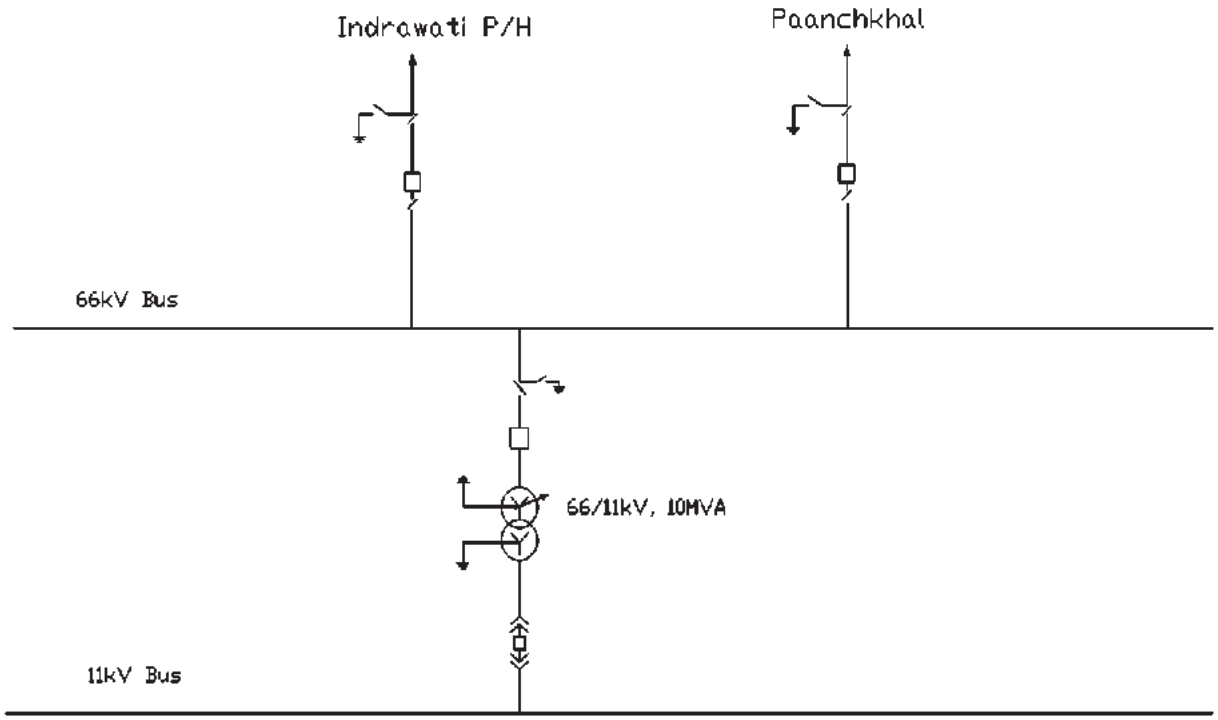
SUBSTATION CAPACITY 132/11kV: 22.5MVA
SUBSTATION CAPACITY 132/11kV: 30MVA
PEAK LOAD 132/11kV: 10MVA



35. INDRAWATI SUBSTATION

Indrawati Substation located at Indrawati Sindhupalchok district, Bagmati zone was constructed to evacuate the power from Indrawati power house and to feeds the power to Melamchi area.The installed capacity of Indrawati substation is 10MVA.

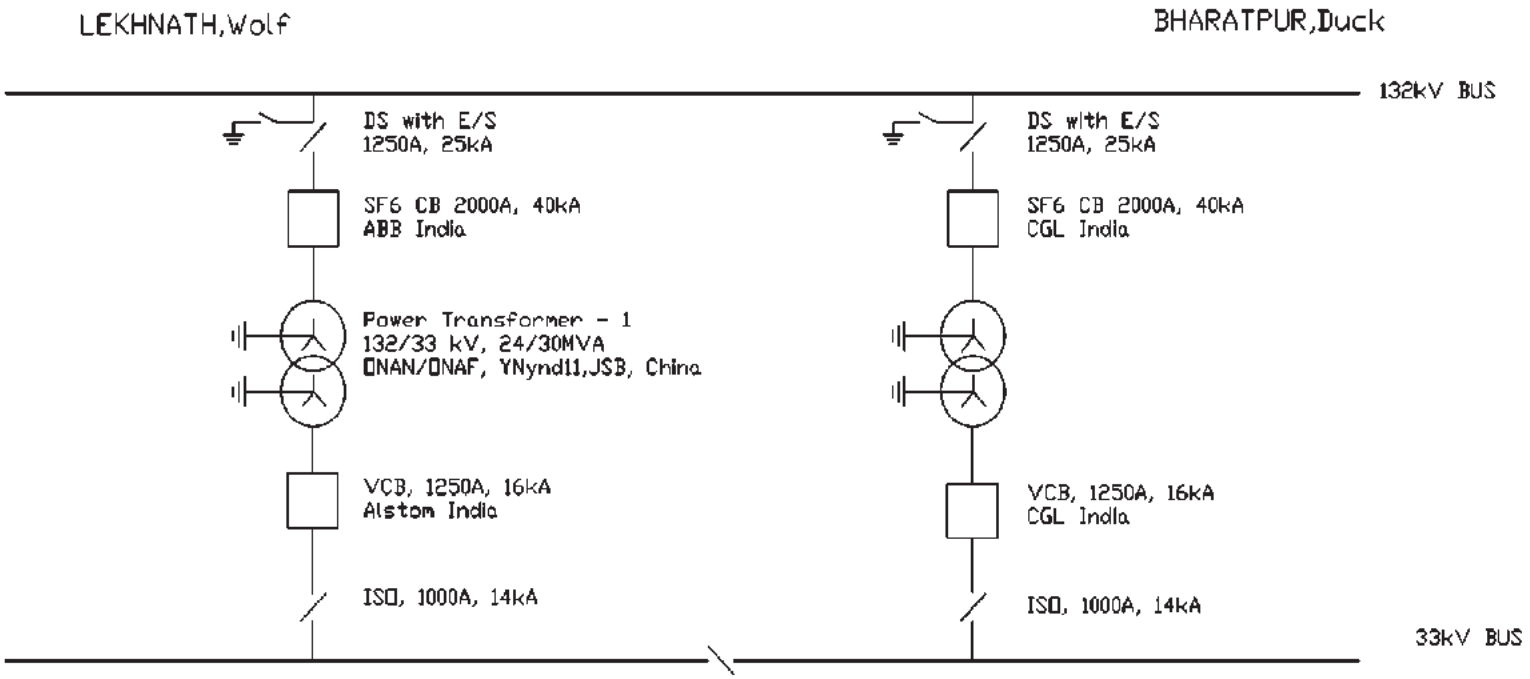
Installed Capacity : 66/11kV, 10MVA
Maximum Demand : 4.8 MVA



36. DAMAULI SUBSTATION

This substation with Single Bus System located at Damauli Municipality in Tanahun district, Gandaki zone feeds power to Aabu Khaireni, Gorkha, Kurintar, Lamjung, Tharpu and Damauli. Damauli Substation is connected by Disconnecting Switches with Lekhnath and Bharatpur Substations through 132kV Single Circuit Lines. This Substation was commissioned in 1983 with 132/33kV, 5MVA capacity. Later on the Transformer was upgraded to 20MVA Transformer in 2000. In 2005 the existing 20MVA Transformer got damaged and a 7.5MVA Transformer was placed and the same Transformer was replaced by 10MVA Transformer in 2006. In 2007 another 10MVA Transformer was added in addition to the existing Transformer. In 2012 3MVA, 33/11 KV was replaced by 16.6MVA Transformer ,In 2018 both 10MVA ,132/33kV transformer was replaced by two 30MVA transformer.

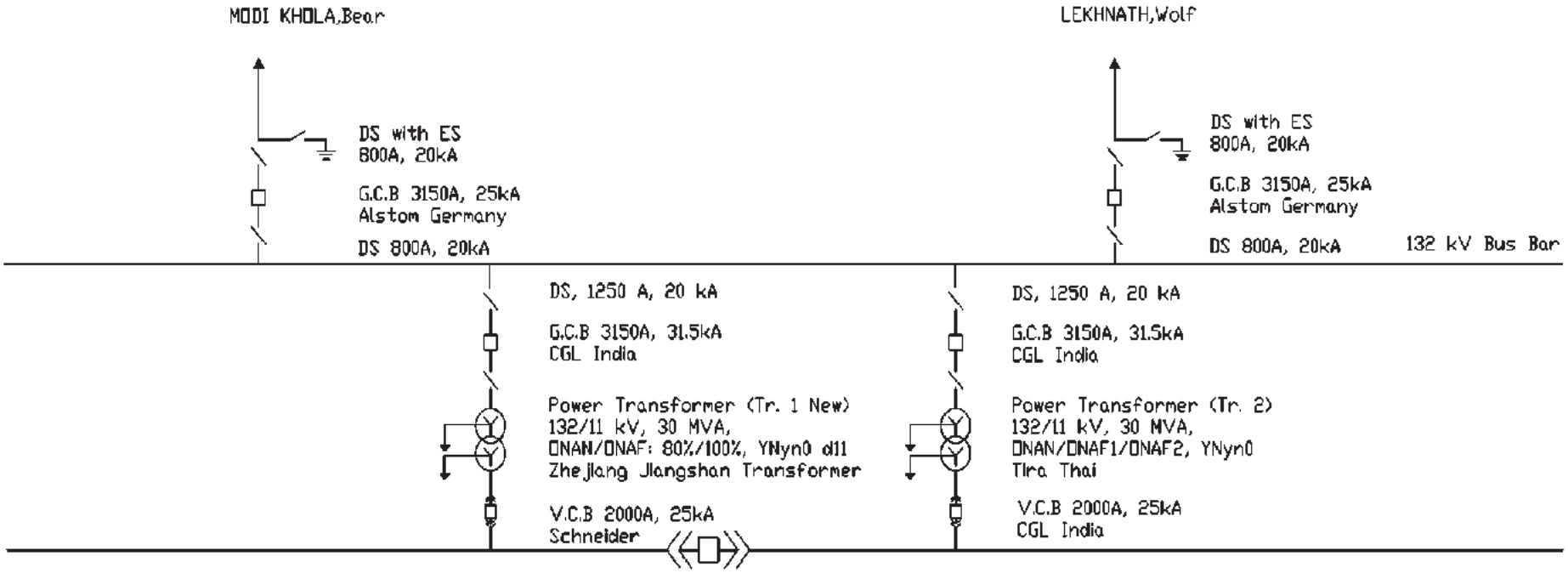
Installed Capacity : 132/33kV, 60MVA
Maximum Demand : 24.23MVA



37. POKHARA SUBSTATION

Pokhara Substation with Single busbar system located at Pokhara Metropolitan city of Kaski district, Gandaki zone feeds power to Hemja, Armala, PID, Pokhara City, Fewa, Arwa, Sarangkot ,Airport,City, Baidam. Pokhara Substation is fed by Modi Power House through 132kV Single Circuit Line. Pokhara Substation is also fed through 11kV by Fewa Hydro and Seti Hydro. Pokhara Substation is also connected with Lekhnath Substation through 132kV Single Circuit Line. This Substation was commissioned in 1980 with 132/11kV, 6MVA capacity. The substation was upgraded to 13.5MVA capacity with the addition of 7.5MVA Transformer by the Fifth Power project in 1989. In 2002 the existing 6MVA Transformer was replaced by 15MVA. In 2008 a new Transformer Bay with 30MVA Transformer was constructed and the existing 7.5MVA Transformer was removed by the Substation Reinforcement project.. Further the 15MVA Transformer was upgraded to 30MVA in 2014..

Installed Capacity : 132/11kV, 60MVA
Maximum Demand : 50.07MVA

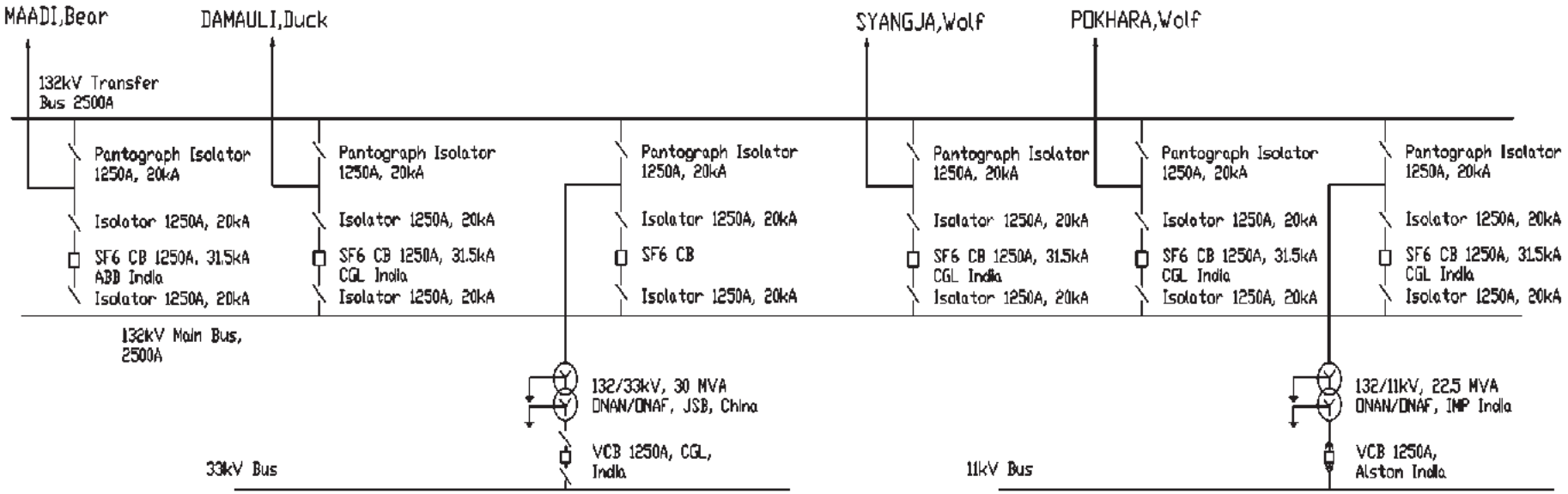


38. LEKHNATH SUBSTATION

Lekhnath Substation with Main and Transfer Bus System located at Lekhnath Municipality of Kaski district, Gandaki zone feeds power to Budibazar, Bijaypur, Begnash and Khaireni. This Substation is connected with Pokhara , Damauli, Syangja Substations and 25MW Upper Madi Hydropower through 132kV Lines. This Substation was commissioned in 2002 with 132/11kV, 12.5MVA capacity. One new 132/11kV, 22.5MVA Transformer Bay was added in the year 2017 and old 12.5MVA was removed. Further to evacuate the Power from IPP's in 33kV 132/33kV, 30MVA Power Transformer was installed in 2018.

Installed Capacity : 132/33kV, 30MVA
Maximum Demand : 14.62MVA

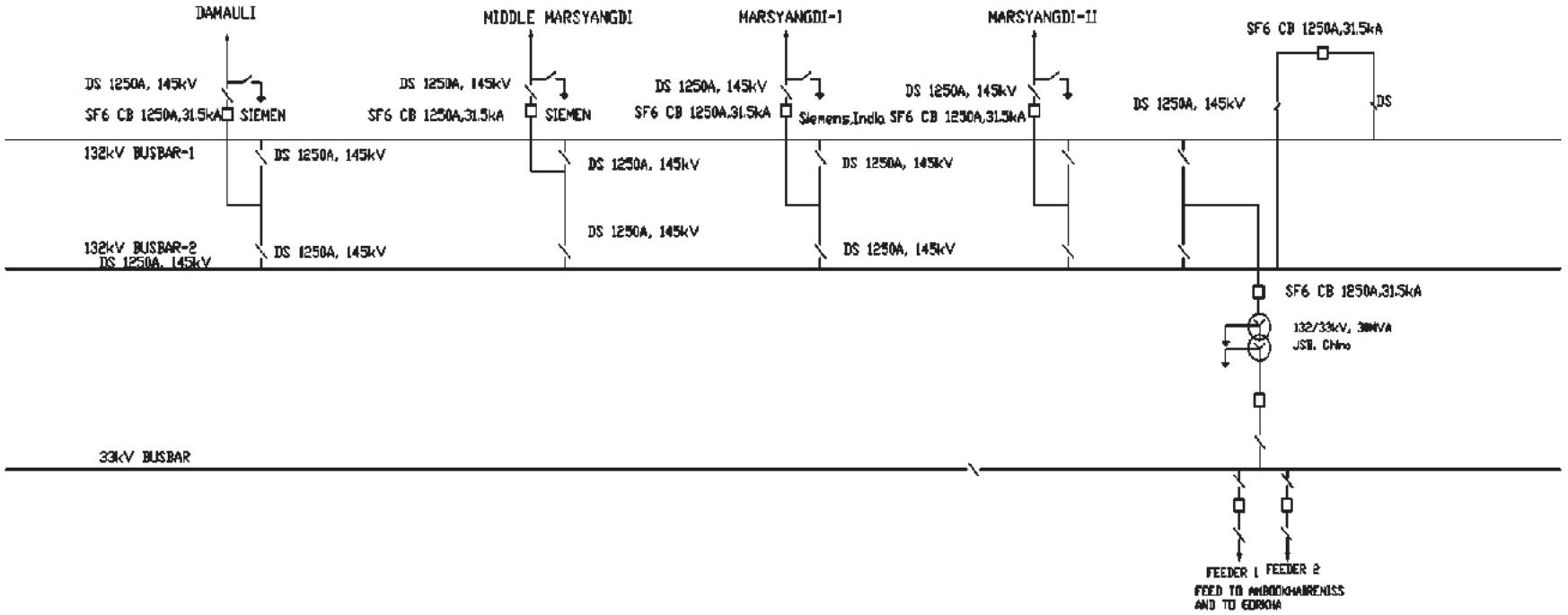
Installed Capacity : 132/11kV, 22.5MVA
Maximum Demand : 14.62MVA



39. NEW MARSYANGDI (MARKICHOWK) SUBSTATION

New Marsyangdi substation is a double bus bar system. This Substation is located at Markichowk of Tanahu district of Gandaki zone feeds power to Anbookhaireni(TANAHU) and Gorkha DISTRICT. The availabilty of 132 kV at this SS is used for stepping up to 220 kV for Marsyangdi-Kathmandu 220 kV TLP . This substaion is connected to Damauli SS Middle MarsyangdiHEP and Lower Marsyangdi HEP. At this SS double ckt gets loop in from damauli and middle HEP and double ckt gets loop out to lower marsyangdi HEP. There are 4 bays of 132 kV , 1 bay of 132 kV buscoupler , 1 bay of 132 kV of transforer bay and 2 bays of 33 kV bays for distribution. 132/33 kV, 30 mVA Capacity power transformer has been installed. The whole work was completed,tested ,commissioned and charged on fy 2075/76 DATED: 2075.12.21 B.S.

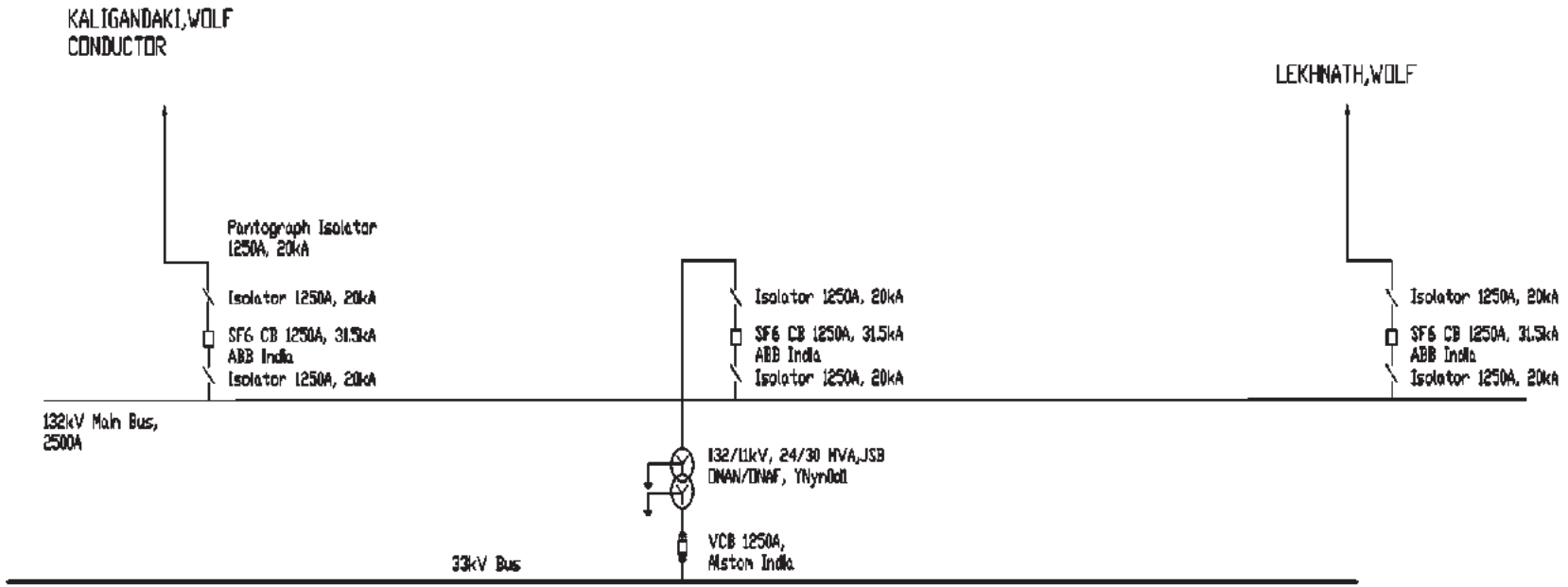
Installed Capacity : 132/33kV, 30MVA
Maximum Demand : 15MVA



40. SYANGJA SUBSTATION

Syangja Substation with Single Bus System located at Rangkhola of Syangja district, Gandaki zone feeds power to Badkhola and Galyan area. Syangja Substation is fed by Kaligandaki Power House and Lekhnath Substation through 132kV Single Circuit Lines. The Substation was commissioned in 2013 with 132/33kV, 30MVA and 33/11kV, 8MVA Capacities.

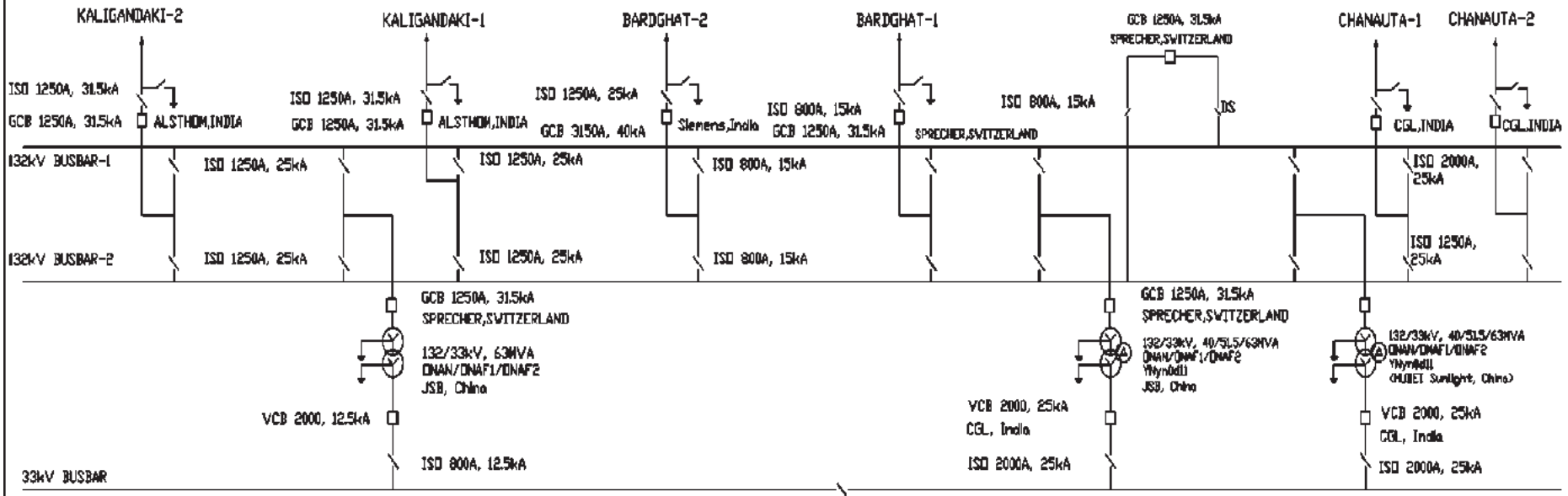
Installed Capacity : 132/33kV, 30MVA
Maximum Demand: 5.18 MVA



41. BUTWAL SUBSTATION

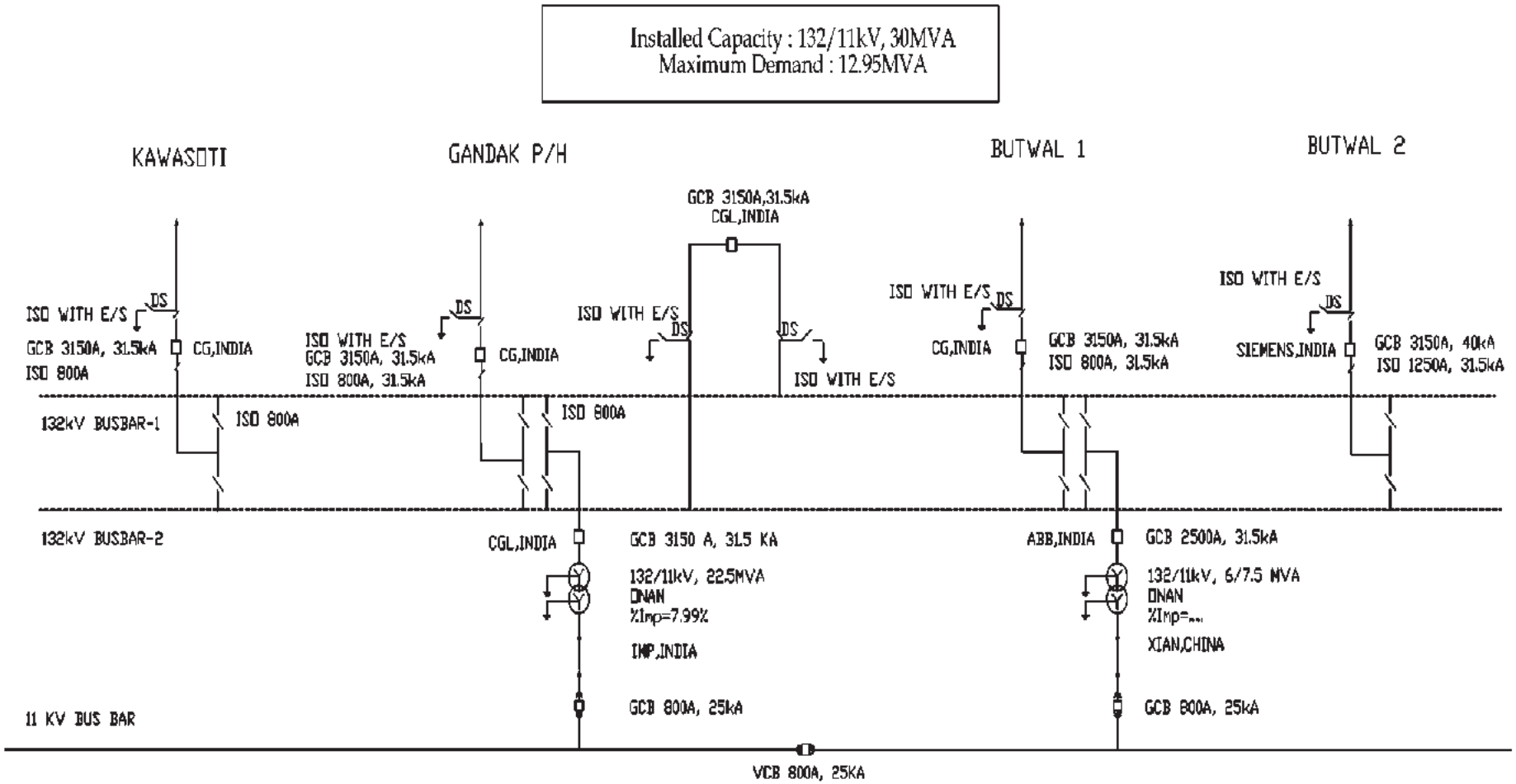
Butwal substation with main and Transfer bus system was recently converted into double bus system. This Substation is located at Jogikuti of Rupendehi district of Lumbini zone feeds power to Butwal, Palpa, Lumbini and Bhairahawa. This substaion is connected to Kaligandaki Power house and Bardaghat substaion by 132kv double circuit line. It is also connected to Chanauta substaion by 132kV Double circuit line.This substation was commissioned in 1985 with 132/33 kV two numbers of 10 MVA transformers. One of the 10MVA transformer was replaced with 132/33kV 30MVA in 2002 and other 10MVA was repalced with 30MVA in 2005. Two line bays are constructed in 2002 to evacuate the power from Kaligandiki Power House. Replacement of one 132/33 kV 30 MVA transformer with 63 MVA transformer will shortly be completed before October 2009. Upgradation of 33/11 kV 8MVA with 16.6 MVA was completed on November 2008. Another 132/33kV, 63MVA Power Transformer has replaced 30MVA Power Transformer in 2010. 33/11kV, 8MVA was upgraded to 16.6MVA in 2015. A new 132/33kV, 63MVA Transformer Bay was added in 2017 and further 33/11kV, 16.6MVA Transformer bay was added in 2019.

Installed Capacity : 132/33kV, 189MVA
Maximum Demand : 168.73MVA



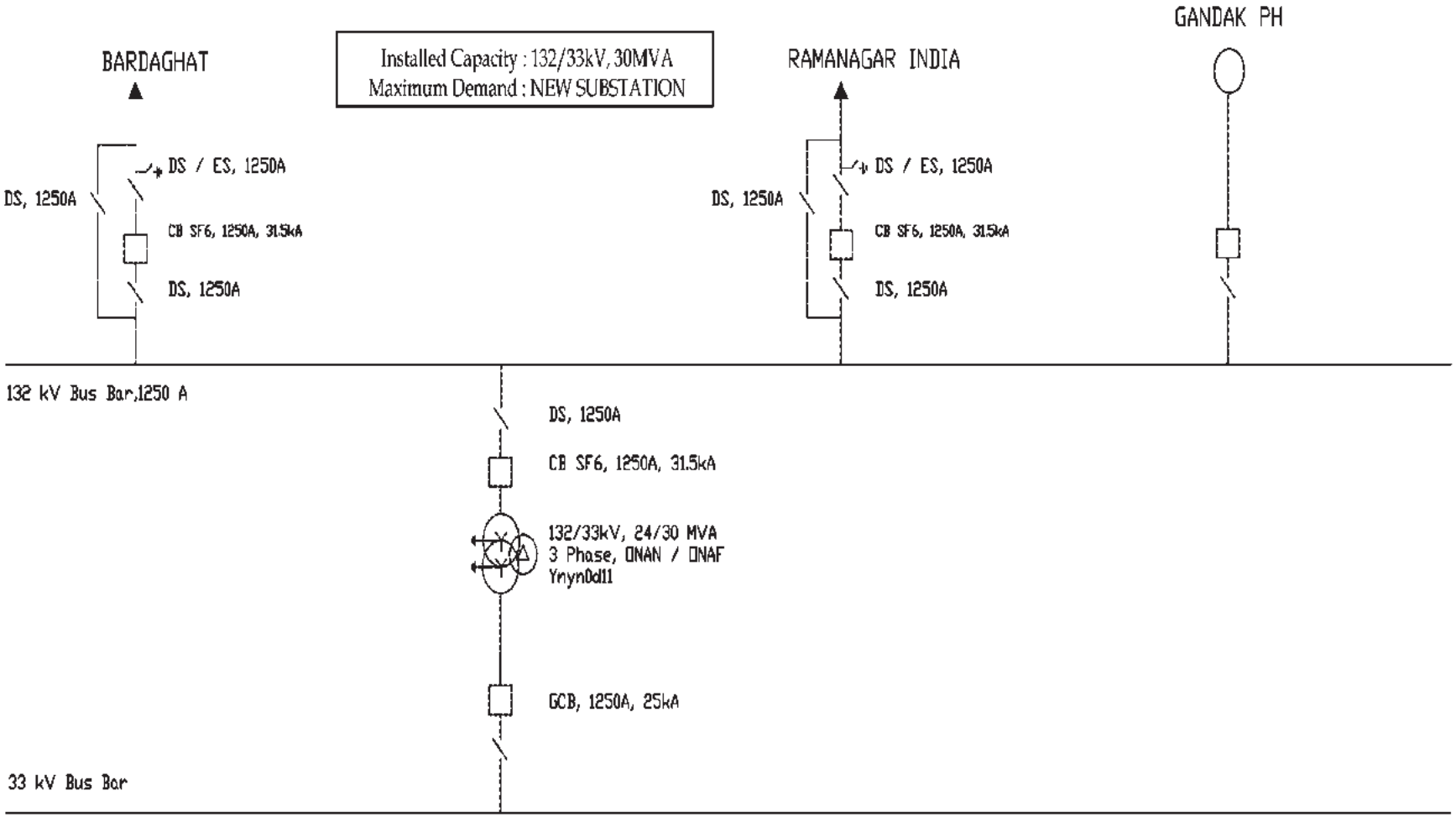
42. BARDAGHAT SUBSTATION

Bardaghat substation with Double Bus system, located at Bardaghat of Nawalparasi district of Lumbini Zone feeds power to Bardaghat, Sunawal, Pratappur and Dumkibas. This substation is connected to Gandak Power House and Bharatpur substation by 132kV single circuit line. It is also connected to Butwal substation by 132kV double circuit line. This substation was commissioned in 1985 with 132/11 kV, 5 MVA capacity. This substation was upgraded to 6 MVA, replacing old 5 MVA in 2002 . In 2006, new transformer bay was constructed and 132/11 kV 5 MVA Transformer was installed to upgrade the substation capacity to 11MVA. The 5MVA transformer was damaged which was replaced by 7.5MVA in 2008. 6MVA Transformer was upgraded to 15MVA in 2015 which was further upgraded to 22.5MVA making the total capacity to 30MVA in 2017.



43. GANDAK SUBSTATION

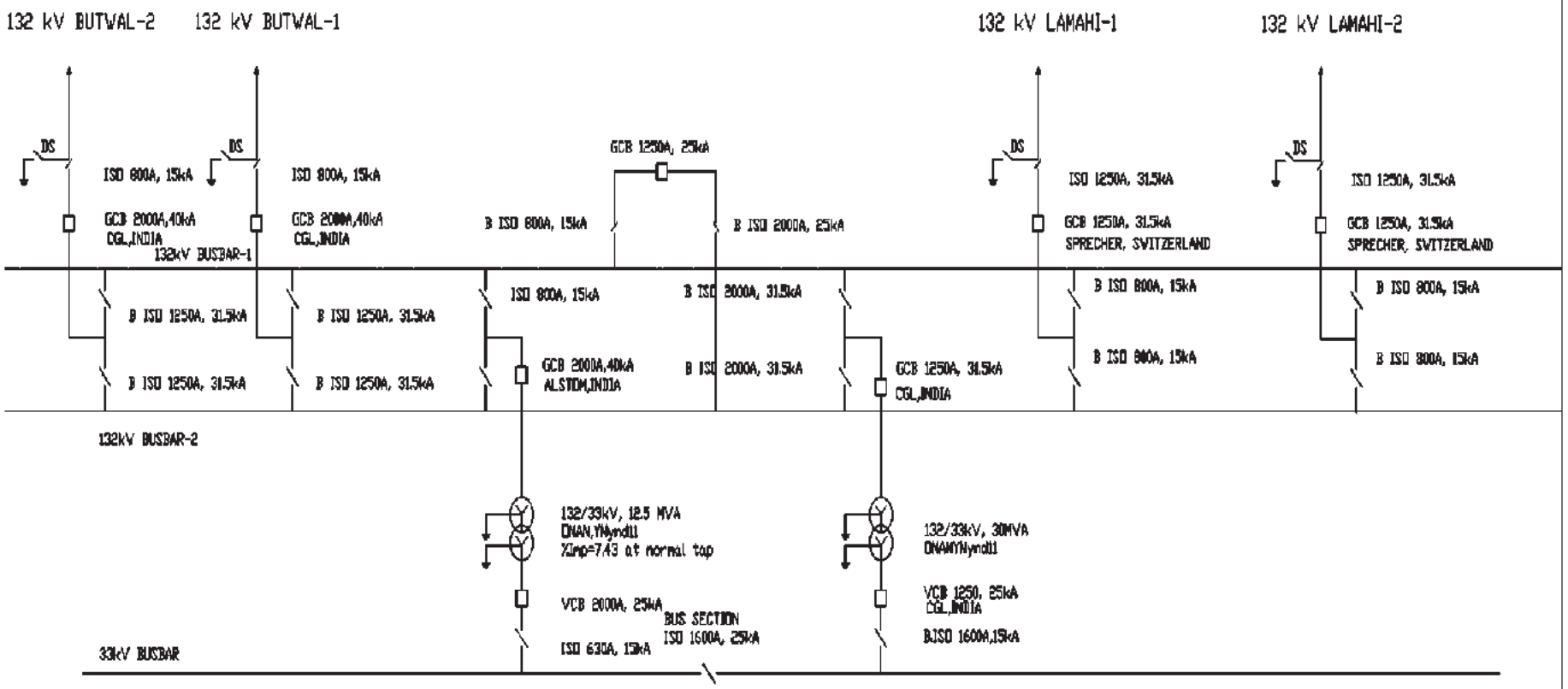
Gandak Substation with single bus system located at Surajpura of Parasi District, feeds power to Parasi and Surajpura area. This substation was built in 2018 A.D. with 132/33 kV,30 MVA Transformer. This Substation is connected with Bardghat S/S and Ramnagar (India) through 132kV Single Circuits. Gandak Power House is also connected in this Substationat 132kV Voltage level.



44. CHANAUTA SUBSTATION

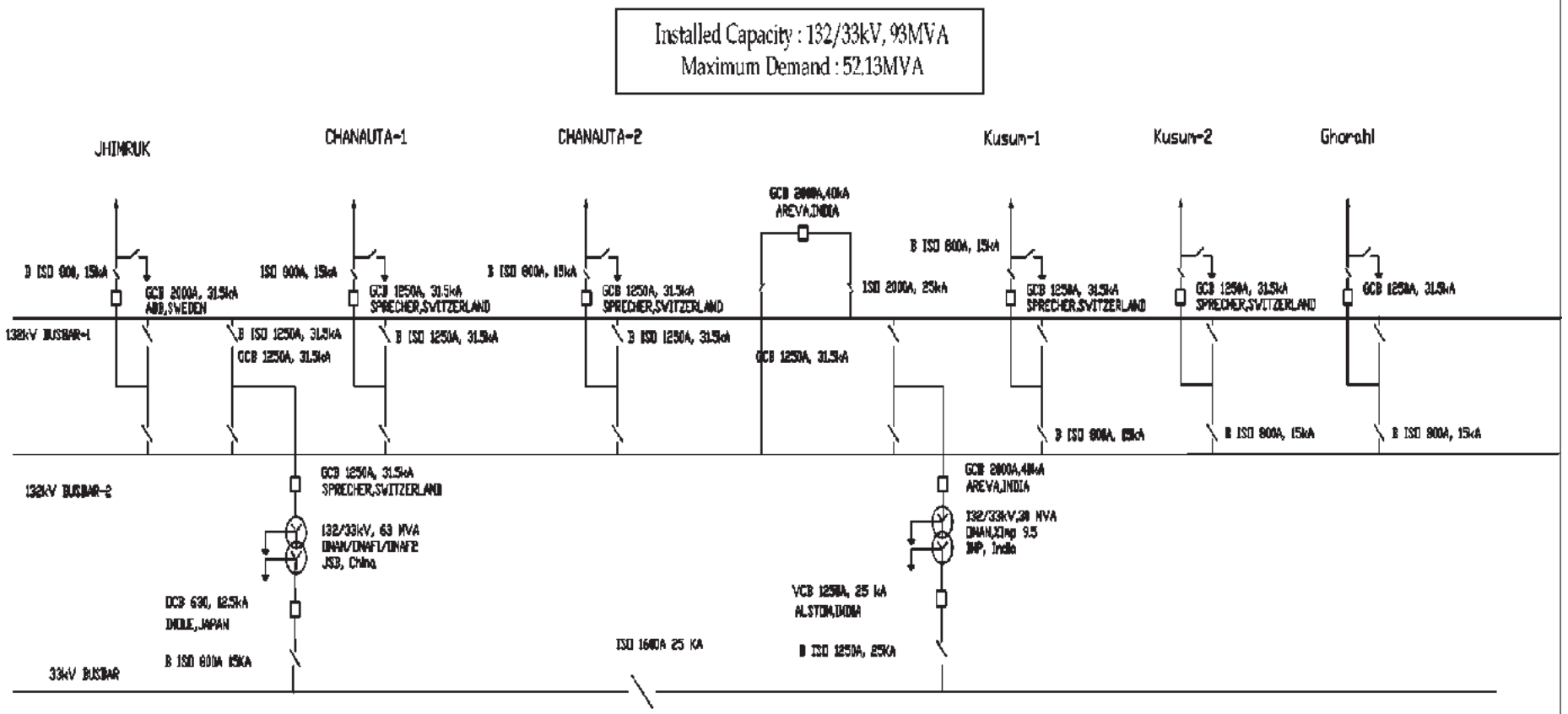
Chanauta substation with double busbar system is located at Chanauta of Kapilvastu district of Lumbini zone and feeds power to Krishnanagar, Pipra,Bahadurgunj and Shivpur. This substaion is connected to Butwal and Lamahi substations by 132kV single circuit line. This substation was commissioned in 1986 by Butwal Nepalgunj Project with 132/33 kV, 5 MVA capacity. This substation was upgraded to 10 MVA by construction of new 5MVA transformer bay in 2004. One of the 5MVA was upgraded to 30MVA in 2010 and the other 5 MVA was upgraded to 12.5MVA in 2018.

Installed Capacity : 132/33kV, 42.5MVA
Maximum Demand : 36.39MVA



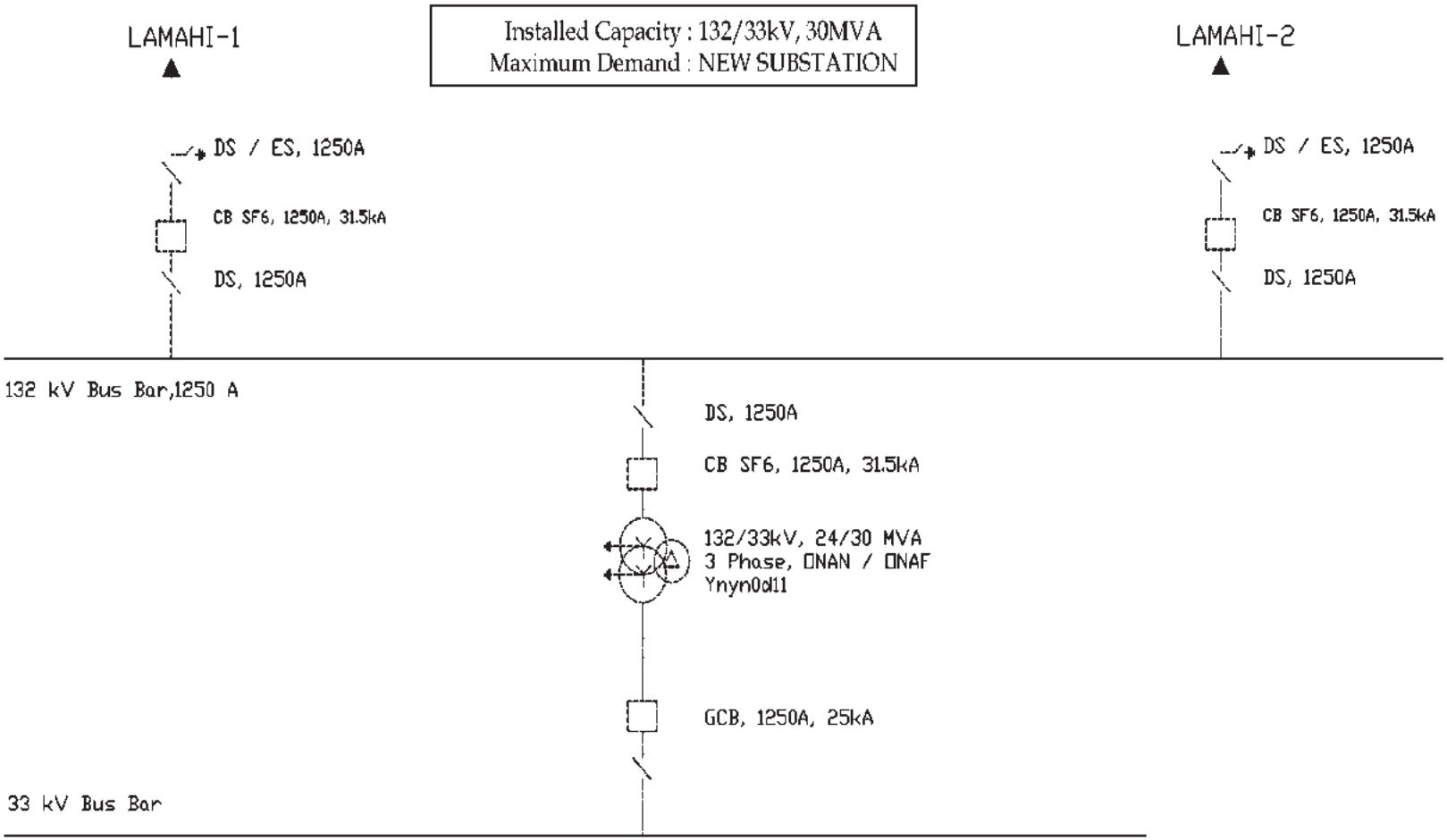
45. LAMAHI SUBSTATION

Lamahi substation with double bus system, located at Lamahi of Dang district of Rapti zone feeds power to Lamahi, Ghorahi, Satvariya and Bhalubang. This substaion is connected to Jhimruk power house by 132kv single circuit line to import the IPP's power to NEA grid. This substaion is also connected to Chanauta and Kohalpur substaions by 132kv Double circuit line . Recently the Substation was connected also to Ghorahi Substation through 132kV Single Circuit. This substation was commissioned in 1986 with 132/33 kV, 5 MVA capacity. In 1988 10MVAr reactor was installed to control the over voltage. This substation was upgraded with replacement of 5MVA by 7.5MVA in 2004 and construction of 7.5MVA transformer bay in 2006. The substation, orginally with single bus system, was converted to double bus system in 2006. One of the 7.5MVA Transformer was upgraded to 30MVA in the year 2012 and another 7.5MVA was upgraded to 30 in the year 2016. That 30MVA was further upgraded to 63MVA in the year 2018.



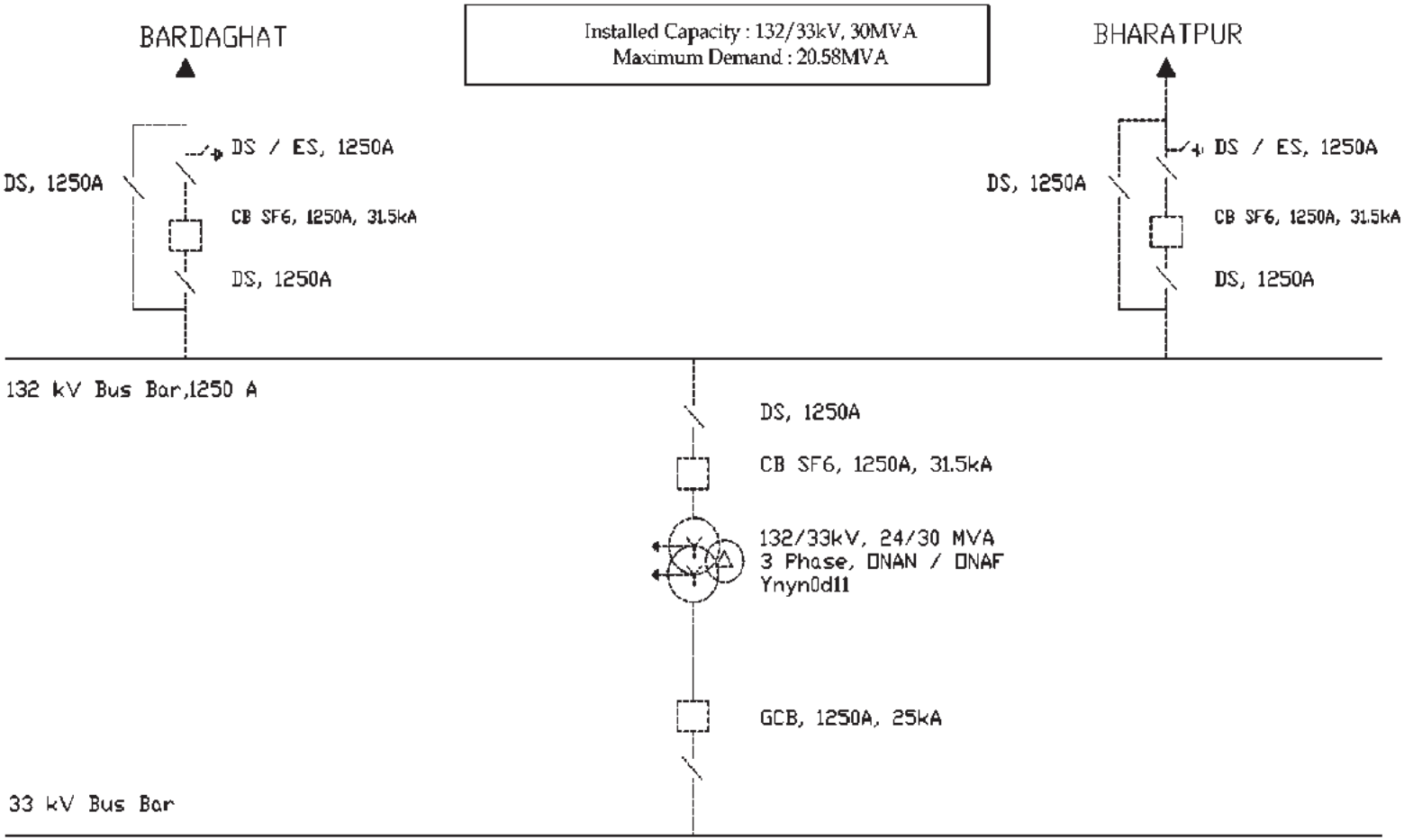
46. GHORAHI SUBSTATION

Ghorahi Substation with single bus system located at Ghorahi of Dang District, feeds power to Ghorahi and Tulsipur area. This substation was built in 2019 A.D. with 132/11 kV, 24/30 MVA Transformer. This Substation is connected with Lamahi S/S to facilate smooth power flow and to supply increasing power demand of local area.



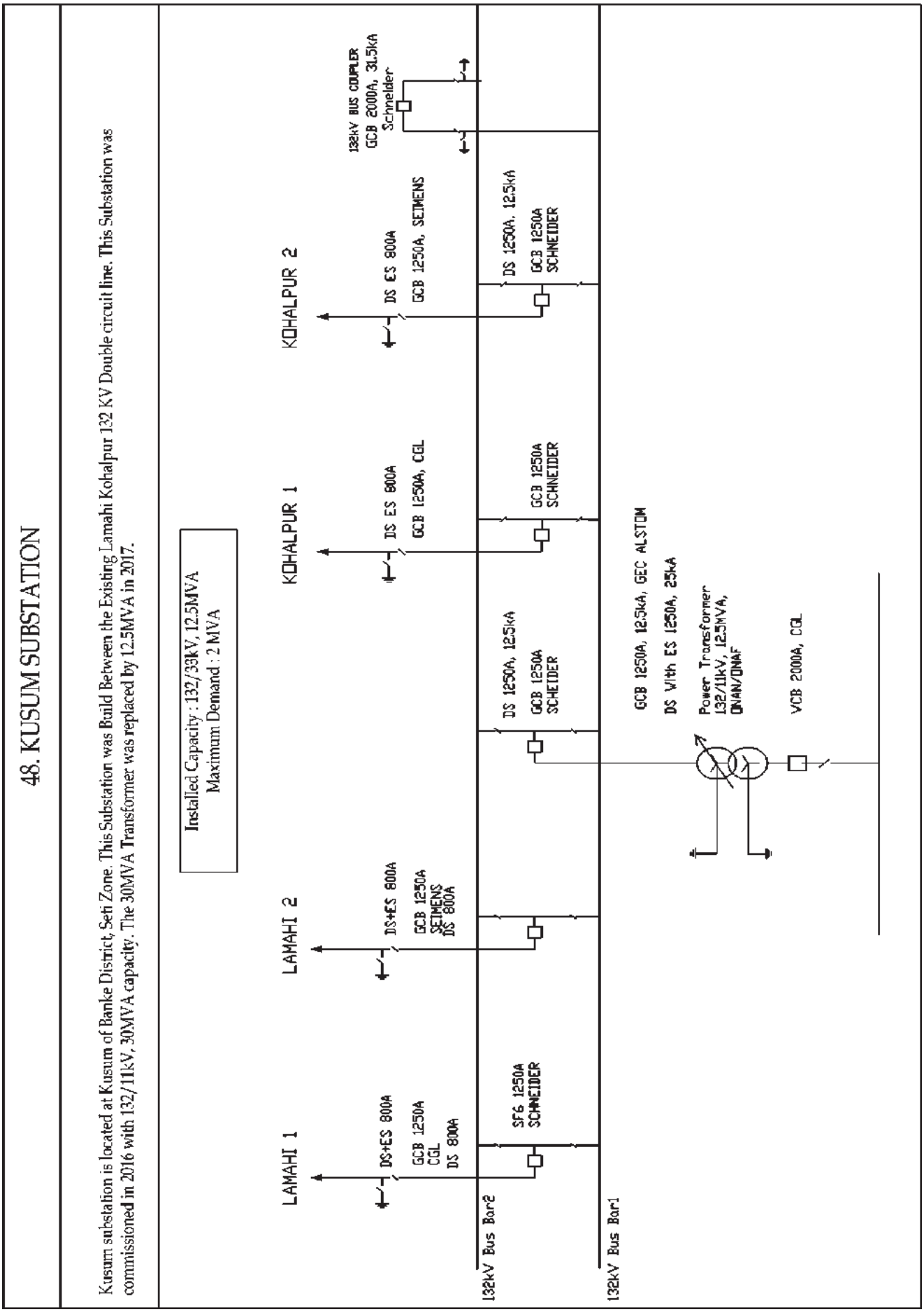
47. KAWASOTI SUBSTATION

Kawasoti Substation with single bus system located at Nawalparasi District, feeds power to Kawasoti, Mukundapur and local surrounding area. This substation was built in 2009 A.D. with 132/11 kV, 24/30 MVA and 33/11 kV, 6/8 MVA Transformers with the grant aid of Japanese Goverment. This Substation is interconnected with Bardaghat and Bharatpur S/S to facilate smooth power flow and to supply increasing power demand of local area. The $\frac{33}{11}$kV, 8MVA Transformer was upgraded to 16.6MVA in the year 2017.



48. KUSUM SUBSTATION

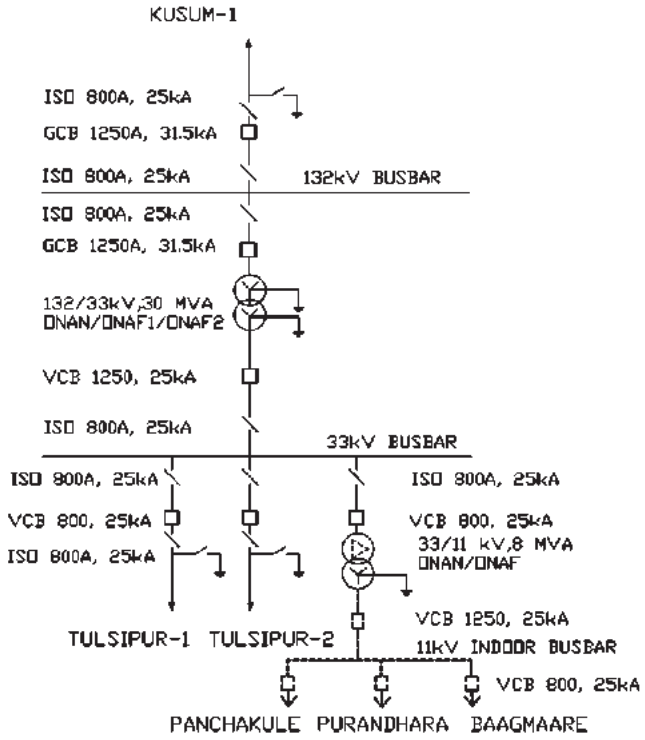
Kusum substation is located at Kusum of Banke District, Seti Zone. This Substation was Build Between the Existing Lamahi Kohalpur 132 KV Double circuit line. This Substation was commissioned in 2016 with 132/11kV, 30MVA capacity. The 30MVA Transformer was replaced by 12.5MVA in 2017.



49. HAPURE SUBSTATION

Hapure Substation is located at Babaai Rural Municipality of the Dang District. The Project was initiated for the power supply to the Dang Cement Industries Pvt. Ltd. but now is the main supply of quality Power in Tulsipur Sub-Metropolitian City with two 33 kV feeders and the *Babaai* Rural Municipality from Panchakule, Purandhara and Baaghmaare 11 kV feeders. The substation is constructed as a Single Bus bar system both for 132 kV and 33 Kv and indoor bus bar of 11 kV. The substation receives Power from Kusum Substation via single Circuit 132 kV Bear Conductor in a Double Circuit Tower. The substation was Commissioned partly on 29/08/2017 for the 132/33 kV and 25/12/2018 for the 33/11 kV Substation. The 132/33 kV Substation consists of one 132 kV incoming line, one 132/33 kV, 30 MVA Power Transformer and two 33 kV outgoing line. The substation was constructed by the Contractor TBEA Deyang Cable Co. Ltd. The 33 kV Busbar was extended to construct one 33/11 kV, 8 MVA Transformer Bay with three 11 kV Outgoing Feeders. The 33/11 kV Substation was constructed by Ms. Mudbhary & Joshi Construction Pvt. Ltd. The two 33 kV line feeds the Tulsipur 33/11 kV Substation while three 11 kV feeder distributes power to the Western Region of the Dang valley.

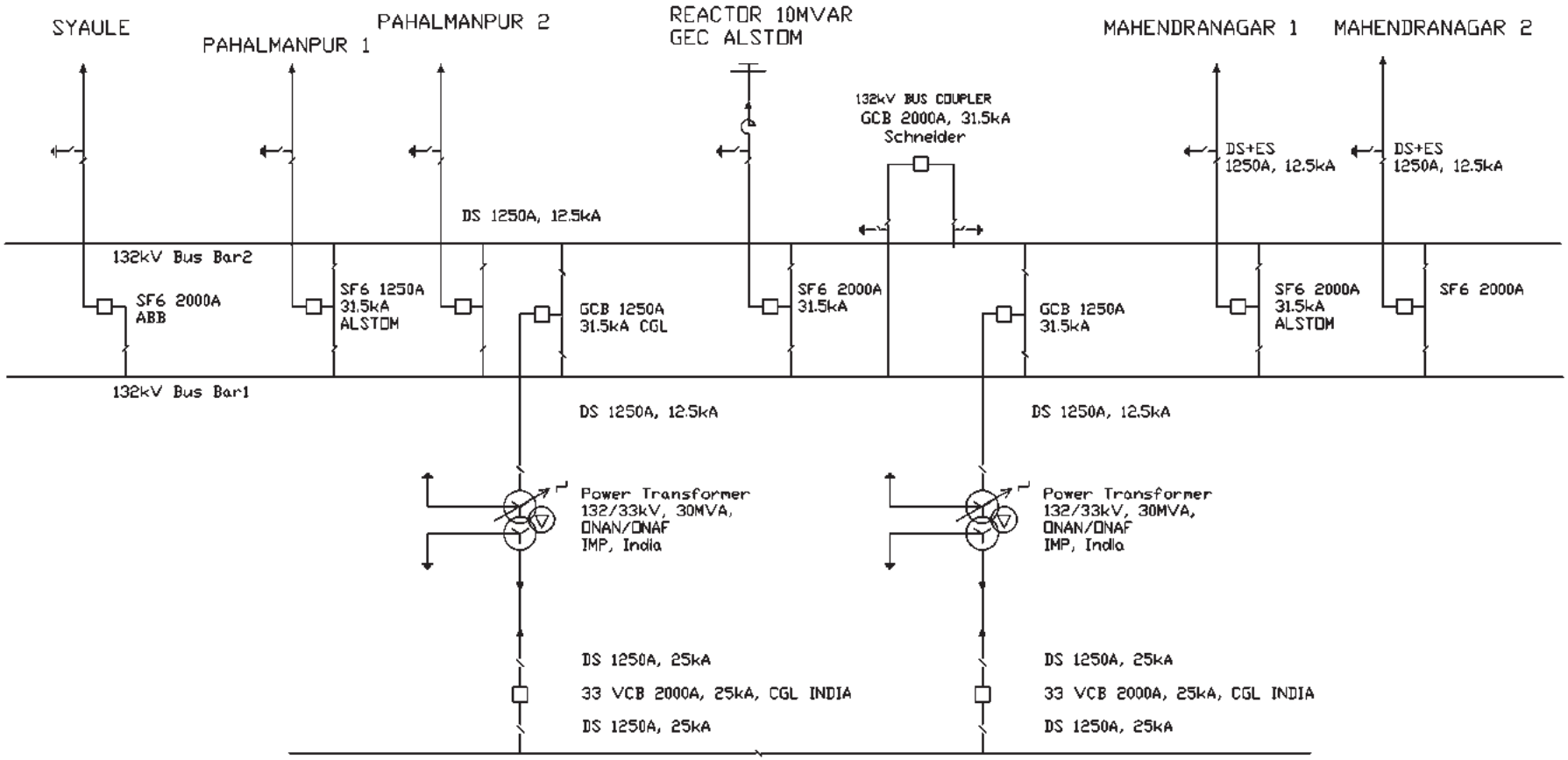
Installed Capacity : 132/33kV, 30MVA
Maximum Demand : 19MVA



50. ATTARIA SUBSTATION

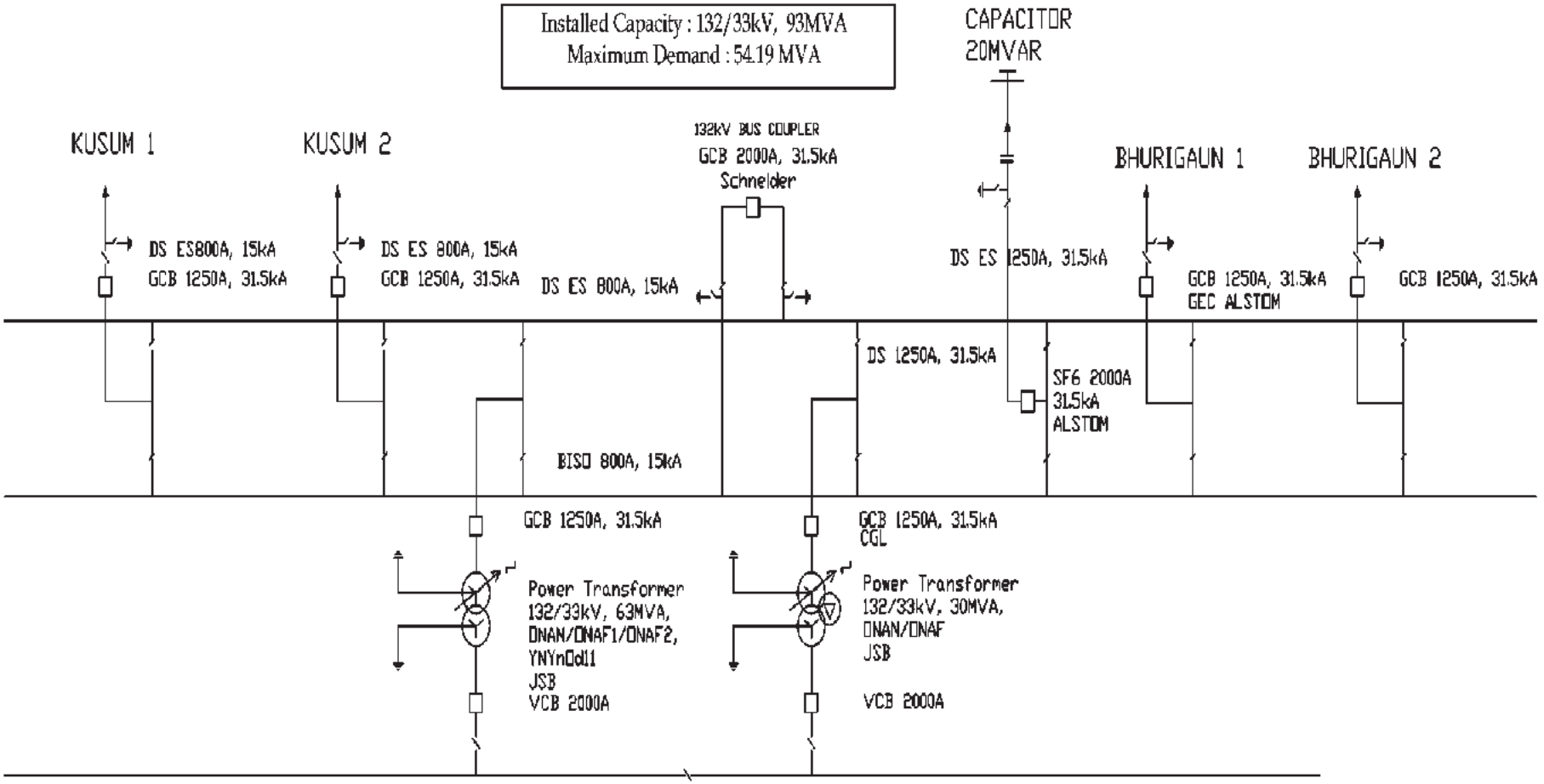
Attaria substation with single bus system, located at Attariya of Kailali district of Seti zone feeds power to Dhangadi, Dipayal, Attariya, Krishnapur, Chaumala and Geta.This substation is connected to Mahendranagar and Pahalmanpur substations by 132 kV double circuit line and Syaule Substation by 132kV Single Circuit Line. This Substation was built in 1992 with the grant aid of French Government with 132/33kV, two numbers of 7.5 MVA transformers. Later, the KKREP installed the 33/11kV, 3MVA transformer. One of the 7.5MVA Transformer was upgraded to 15MVA in 2009 while the other 7.5MVA was upgraded to 15MVA in 2014. Those Transformers were further upgraded to 2x30MVA in 2016.

Installed Capacity : 132/33kV, 60 MVA
Maximum Demand : 28.72 MVA



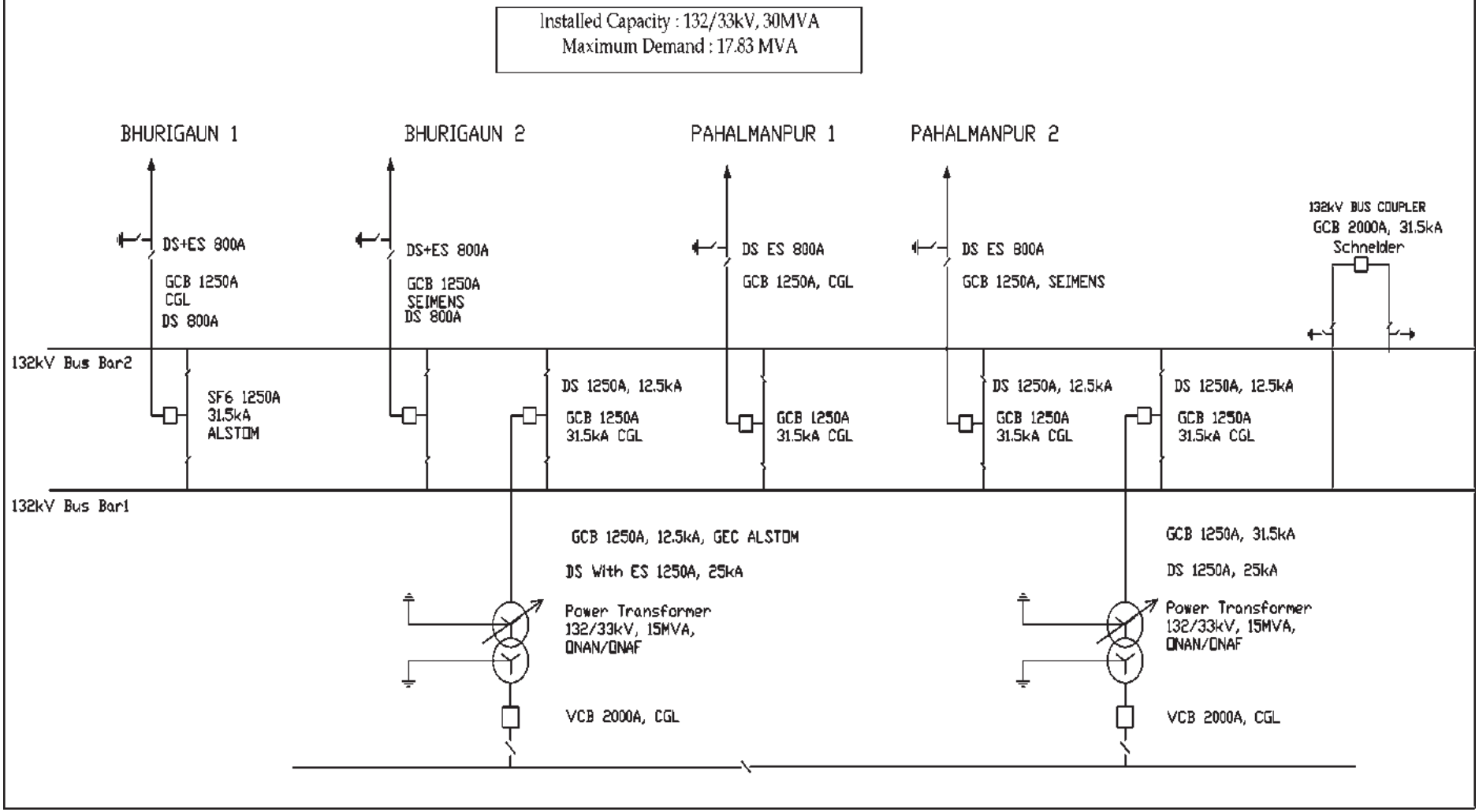
51. KOHALPUR SUBSTATION

Kohalpur substation with double bus system, located at Kohalpur of Banke District feeds power to Surkhet, Gulariya, Nepalgunj, Ranjha and Kohalpur. This substaion is connected to Lamahi and Lamki substaions by 132kv double circuit line. This Substation was commissioned in 1987 with 132/33kV, two numbers of 5MVA transformers. The main and transfer bus system was converted to double bus system in 2002. One of the 5MVA Transformer was replaced by 10MVA Transformer in 2002, which was again replaced by 15MVA single phase transformer after 10MVA was damaged in 2004. Further upgradation was made in 2007 when another 5MVA Transformer was replaced by a 10MVA transformer. The 10MVA was upgraded to 30MVA in 2015 while the 15MVA was also upgraded to 30MVA in 2017. One of the 30MVA was further upgraded to 63MVA in 2019.



52. LAMKI SUBSTATION

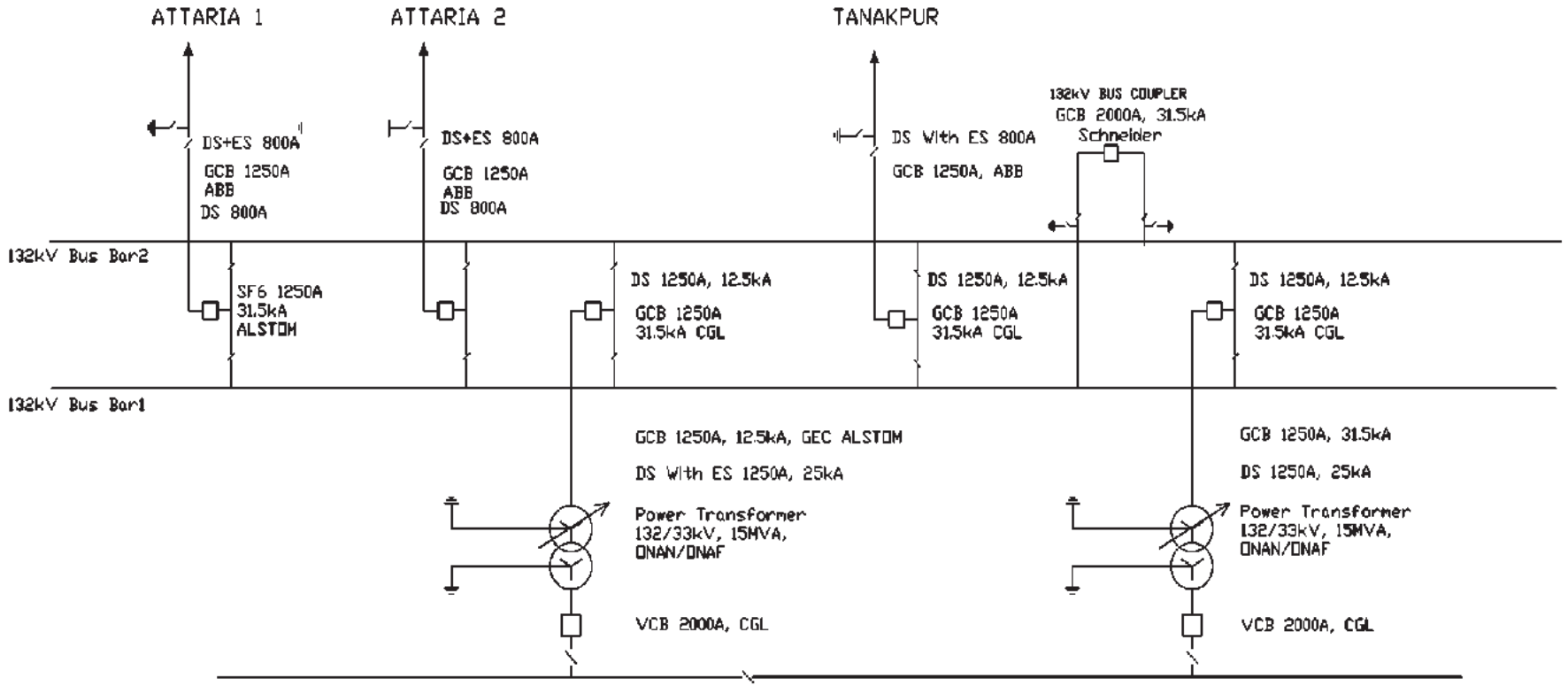
Lamki substation located at Lamki of Kailali District, Seti Zone, feeds power to Lamki, Tikapur, Chuha Lamki, Chisapani and Baliya. This Substation is connected to Bhurigaun and Pahalmanpur by 132 kV double circuit line. This Substation was commissioned in 1992 with the grant aid of French Government with 132/33kV, 7.5MVA capacity. Another 132/33kV, 7.5MVA Transformer bay was added in 2014. The 2x 7.5 MVA Transformers were further upgraded to 2x15MVA one in 2016 and another in 2018.



53. MAHENDRANAGAR SUBSTATION

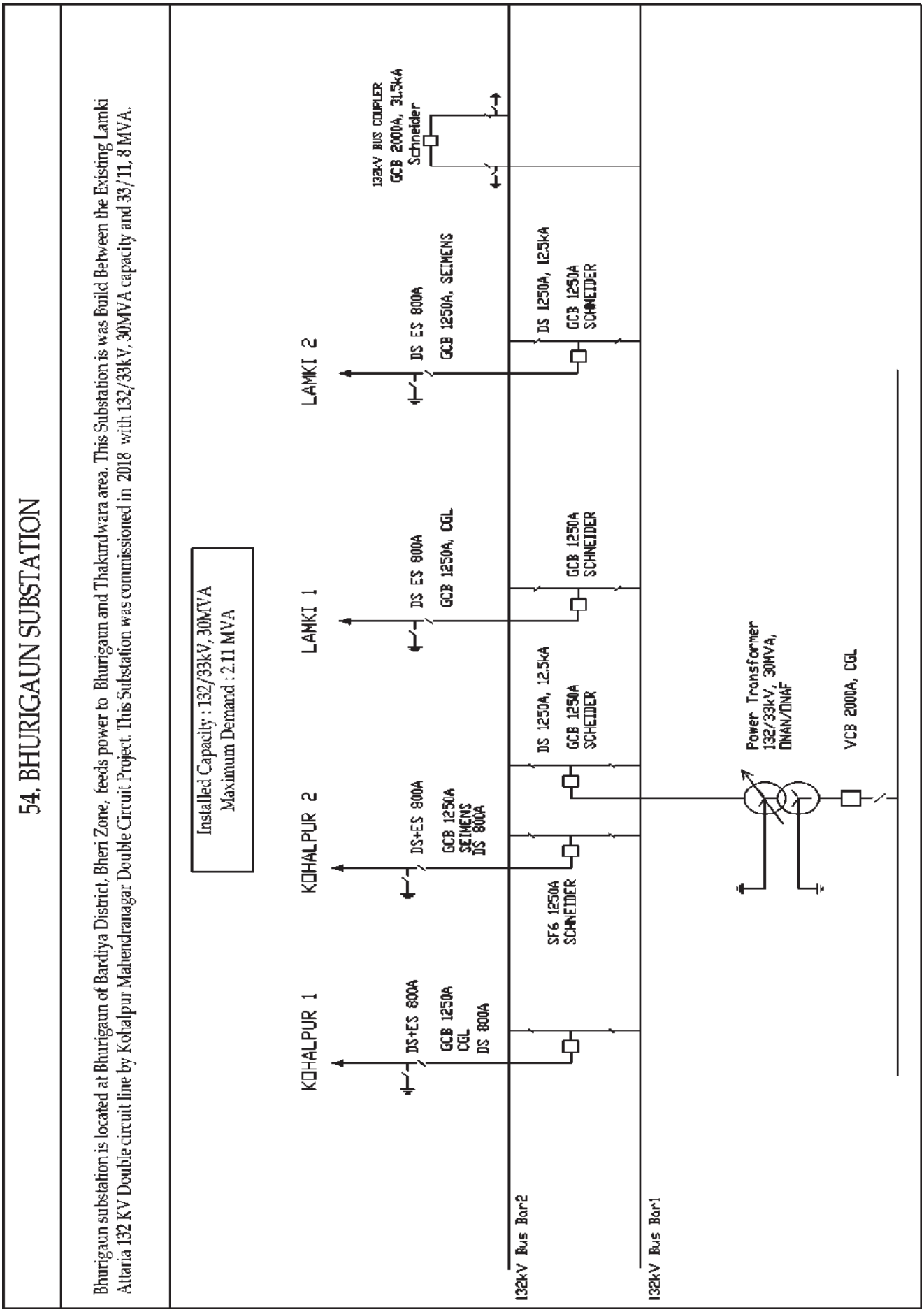
Mahendranagar substation located at Lalpur of Kanchanpur district of Mahakali zone feeds power to Gaddachowki and Jhalari. This subsation is connected to Tanakpur Powerhouse to import the power as per contract agreement between Indian and Nepalese Goverment, which is subsequently connected to Attaria substation by 132 kV double circuit line. This Substation was built in 1992 with the grant aid of French Government with 132/33kV, 7.5MVA capacity. This substation was upgraded in 1999 when the Tanakpur Line bay was added. In 2009 additional 132/33kV, 5MVA Transformer bay with 33kV Feeder was constructed. KKREP has also added one number of 33kV Jhalary Feeder to provide local loads for Jalary and Sripur in FY 2009/10. The 5MVA Transformer was upgraded to 10MVA in 2011. Whereas the 7.5MVA was upgraded to 15MVA in 2017. The 10MVA Transformer was further upgraded to 15MVA in 2019.

Installed Capacity : 132/33kV, 30 MVA
Maximum Demand : 24 MVA



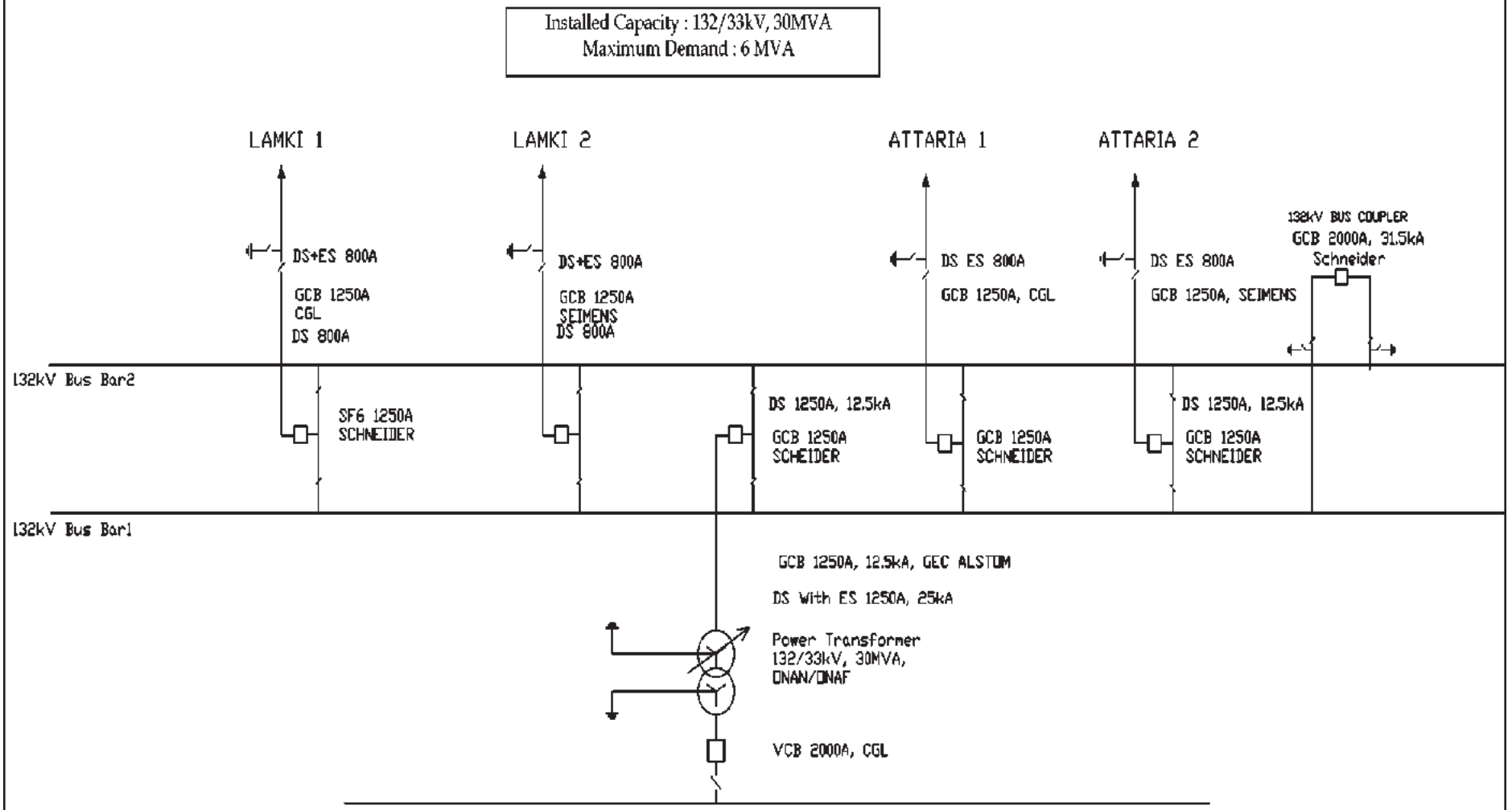
54. BHURIGAUN SUBSTATION

Bhurigaun substation is located at Bhurigaun of Bardiya District, Bheri Zone, feeds power to Bhurigaun and Thakurdwara area. This Substation is was Build Between the Existing Lamki Attaria 132 KV Double circuit line by Kohalpur Mahendranagar Double Circuit Project. This Substation was commissioned in 2018 with 132/33kV, 30MVA capacity and 33/11, 8 MVA.



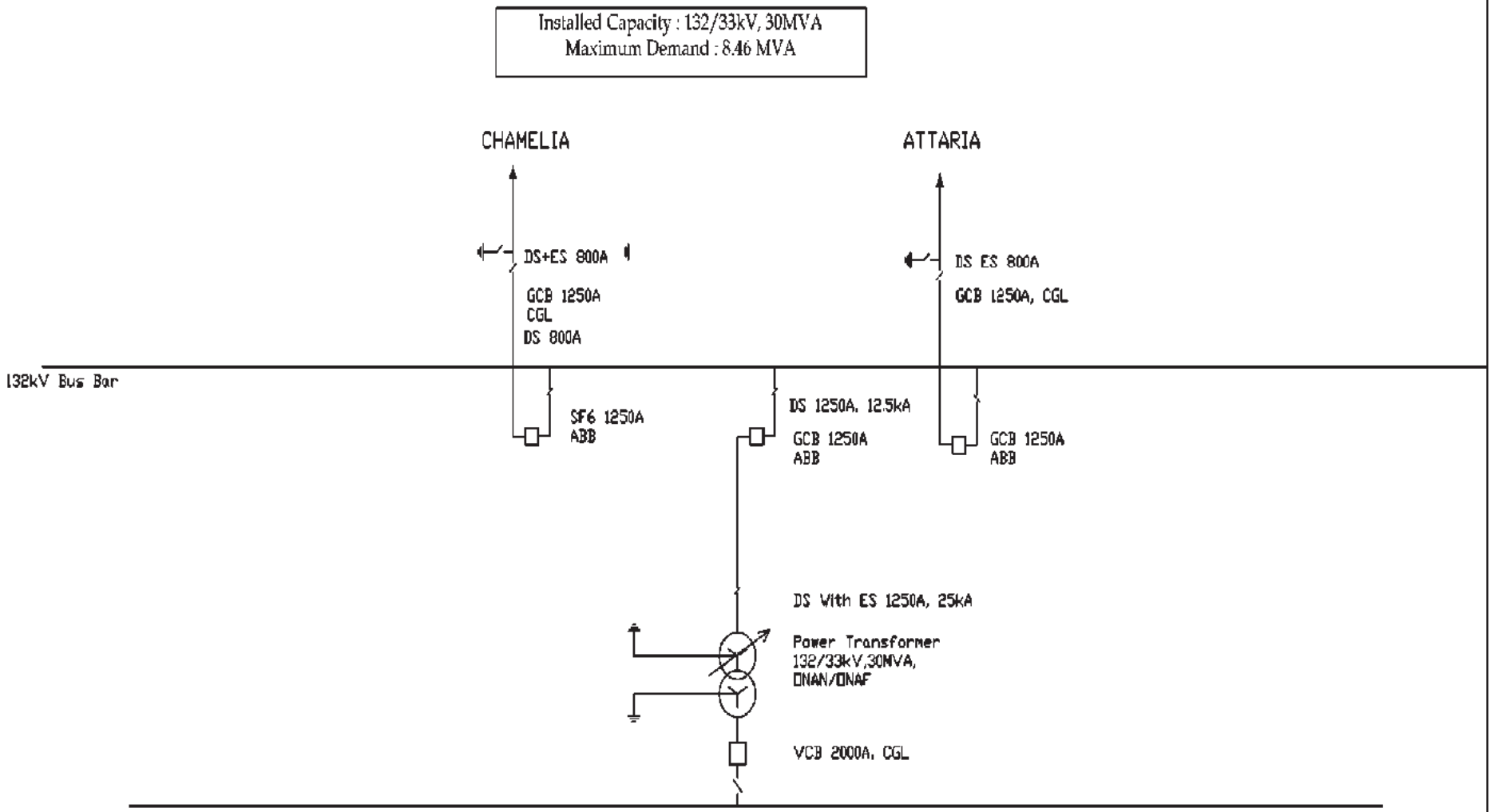
55. PAHALMANPUR SUBSTATION

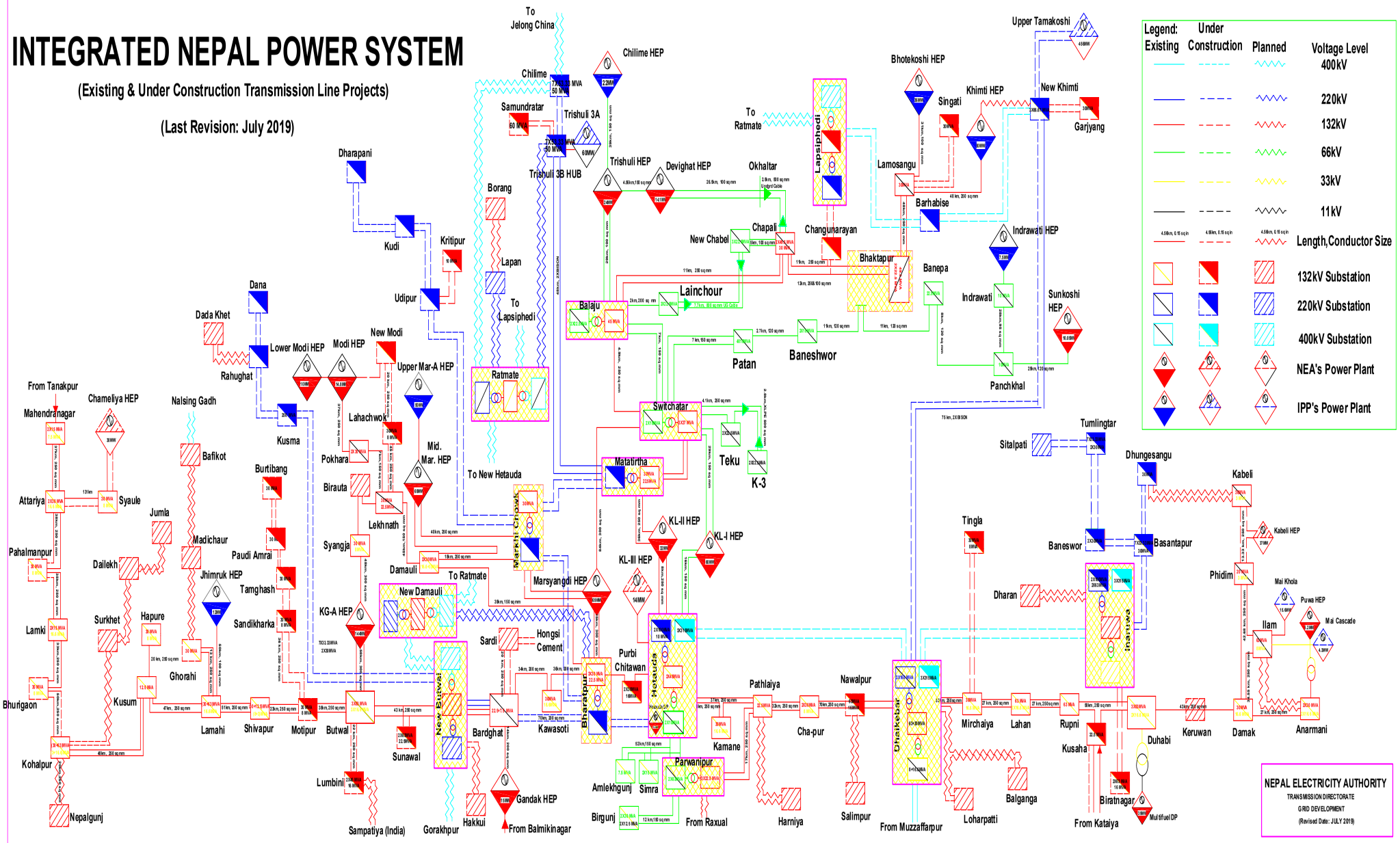
Pahalmanpur substation is located at Pahalmanpur of Kailali District, Seti Zone, feeds power to Pahalmanpur, Chaumala,Hasulia, Masuria and Sukhad area. This Substation is was Build Between the Existing Lamki Attaria 132 KV Double circuit line by Kohalpur Mahendranagar Double Circuit Project. This Substation was commissioned in 2018 with 132/33kV, 30MVA capacity and 33/11, 8 MVA.



56. SYAULE SUBSTATION

Syaule substation is located at Syaule of Dadeldhura District, Mahakali Zone, feeds power to Budar, Doti, Bagarkot, Dadeldhura, Bhatkanda, Doti Ghatal and Sakayal area. This Substation was built Between the Existing Chamelia Attaria 132 KV Single circuit line. This Substation was commissioned in 2018 with 132/33kV, 30MVA capacity and 33/11, 6/8 MVA.

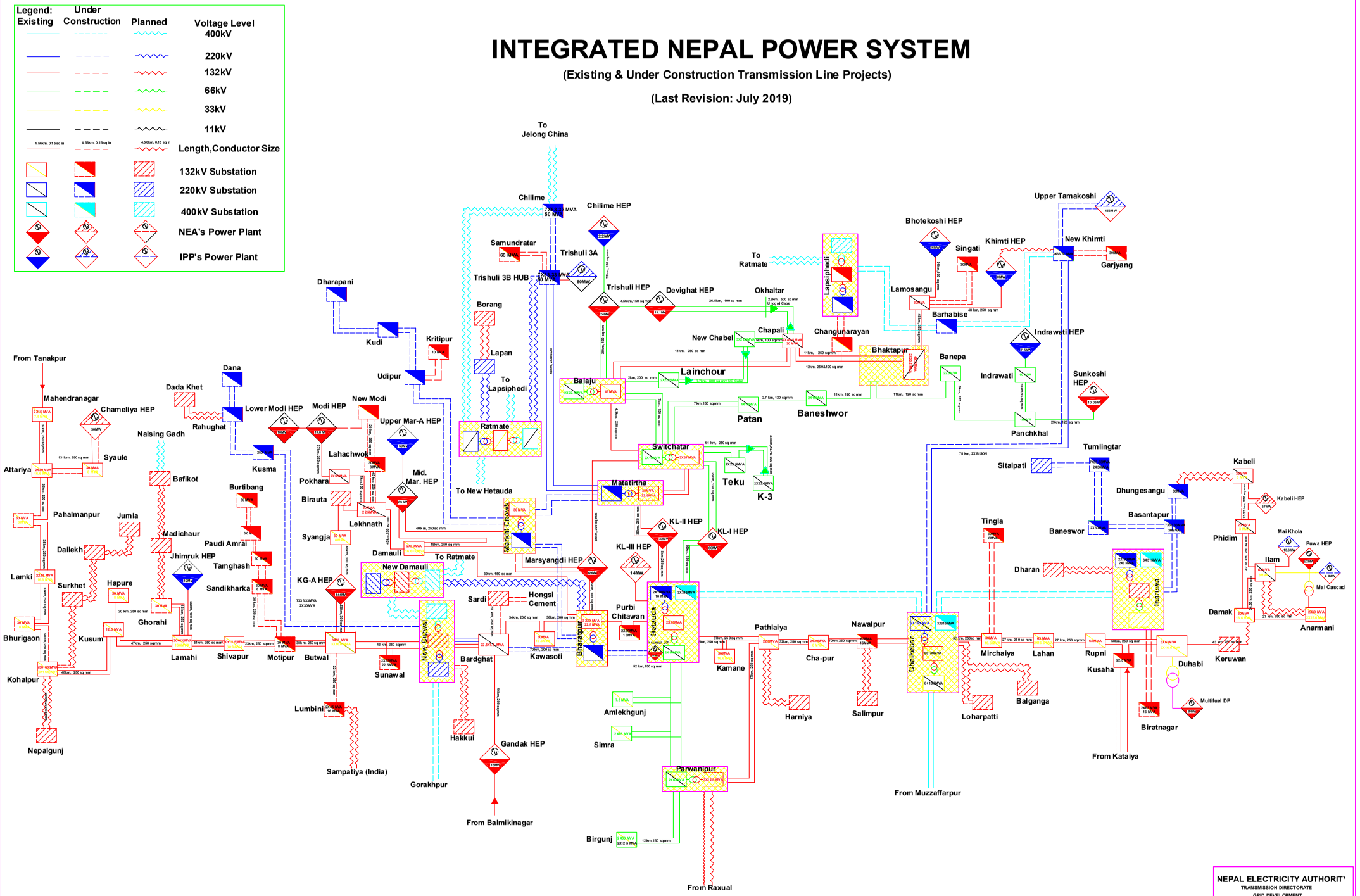



INTEGRATED NEPAL POWER SYSTEM
(Existing & Under Construction Transmission Line Projects)
(Last Revision: July 2019)
Legend:
Existing
Under Construction
Planned
Voltage Level
400kV
220kV
132kV
66kV
33kV
11kV
Length,Conductor Size
132kV Substation
220kV Substation
400kV Substation
NEA's Power Plant
IPP's Power Plant
NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
GRID DEVELOPMENT
(Revised Date: JULY 2019)
To Jelong China
Chilime
Chilime HEP
Samundratar
Trishuli 3A
Trishuli 3B HUB
Trishuli HEP
Devighat HEP
Okhaltar
To Ratmate
Lapsiphedi
Bhotekoshi HEP
Upper Tamakoshi
Khimti HEP
Singati
New Khimti
Garjyang
Lamosangu
Barhabise
Changunarayan
Indrawati HEP
Indrawati
Sunkoshi HEP
Panchkhal
Banepa
Bhaktapur
Dharapani
Kudi
Kritipur
Udipur
Borang
Lapan
To Lapsiphedi
Ratmate
Balaju
New Chabel
Chapali
Lainchour
Patan
Baneshwor
Switchatar
Teku
K-3
Matatirtha
To New Hetauda
Markhu Chowk
Marsyangdi HEP
KL-II HEP
KL-I HEP
KL-III HEP
To Ratmate
Purbi Chitawan
Hetauda
Bharatpur
Parwanipur
Amlekhgunj
Simra
Birgunj
From Raxual
Kamane
Pathlaiya
Cha-pur
Harniya
Nawalpur
Salimpur
Dhalkebar
From Muzzaffarpur
Loharpatti
Balganga
Mirchaiya
Lahan
Rupni
Kusaha
Biratnagar
From Kataiya
Duhabi
Multifuel DP
Keruwan
Damak
Anarmani
Kabeli
Kabeli HEP
Phidim
Mai Khola
Puwa HEP
Mai Cascade
Ilam
Inaruwa
Basantapur
Baneswor
Tingla
Dharan
Sitalpati
Tumlingtar
Dhungesangu
From Tanakpur
Mahendranagar
Chameliya HEP
Attariya
Syaule
Pahalmanpur
Lamki
Bhurigaon
Kohalpur
Nepalgunj
Jumla
Dailekh
Surkhet
Kusum
Hapure
Ghorahi
Lamahi
Nalsing Gadh
Bafikot
Madichaur
Jhimruk HEP
Shivapur
Dana
Dada Khet
Rahughat
Lower Modi HEP
Modi HEP
New Modi
Upper Mar-A HEP
Kusma
Mid. Mar. HEP
Lahachwok
Pokhara
Birauta
Lekhnath
Syangja
Damauli
Burtibang
Paudi Amrai
Tamghash
Sandikharka
KG-A HEP
New Damauli
New Butwal
Motipur
Butwal
Sunawal
Lumbini
Sampatiya (India)
Gorakhpur
Hakkui
Sardi
Hongsi Cement
Kawasoti
Bardghat
Gandak HEP
From Balmikinagar
Motipur
Shivapur
Lamahi
Ghorahi
Sunawal
Kawasoti
Bardghat
Gandak HEP
Hakkui
Gorakhpur
Sampatiya (India)
Lumbini
Butwal
Sandikharka
Tamghash
Paudi Amrai
Burtibang
Lekhnath
Damauli
Syangja
Birauta
Pokhara
Lahachwok
Kusma
Lower Modi HEP
Modi HEP
New Modi
Upper Mar-A HEP
Mid. Mar. HEP
Rahughat
Dada Khet
Dana
Kritipur
Udipur
Kudi
Dharapani
Trishuli 3B HUB
Trishuli 3A
Chilime HEP
Chilime
Jelong China
Lapsiphedi
Ratmate
Lainchour
Balaju
Chapali
New Chabel
Changunarayan
Bhaktapur
Banepa
Baneshwor
Patan
Switchatar
Teku
K-3
Matatirtha
Markhu Chowk
Marsyangdi HEP
KL-II HEP
KL-I HEP
KL-III HEP
Purbi Chitawan
Hetauda
Bharatpur
Parwanipur
Amlekhgunj
Simra
Birgunj
From Raxual
Kamane
Pathlaiya
Cha-pur
Harniya
Nawalpur
Salimpur
Dhalkebar
From Muzzaffarpur
Loharpatti
Balganga
Mirchaiya
Lahan
Rupni
Kusaha
Biratnagar
From Kataiya
Duhabi
Multifuel DP
Keruwan
Damak
Anarmani
Kabeli
Kabeli HEP
Phidim
Mai Khola
Puwa HEP
Mai Cascade
Ilam
Inaruwa
Basantapur
Baneswor
Tingla
Dharan
Sitalpati
Tumlingtar
Dhungesangu

INTEGRATED NEPAL POWER SYSTEM

(Existing & Under Construction Transmission Line Projects)

(Last Revision: July 2019)



NEPAL ELECTRICITY AUTHORITY
TRANSMISSION DIRECTORATE
GRID DEVELOPMENT
(Revised Date: JULY 2019)

Nepal Electricity Authority
Transmission Directorate
Durbar Marg, Kathmandu, Nepal
Tel: +977- 4153077
Email: transmission@nea.org.np
Website: www.nea.org.np

Nepal Electricity Authority
Project Management Directorate
Matatirtha, Kathmandu, Nepal
Tel: +977- 5164104
Email: pmd@nea.org.np
Website: www.nea.org.np