

NEPAL ELECTRICITY AUTHORITY

# TRANSMISSION/PROJECT MANAGEMENT DIRECTORATE

A Year Book-Fiscal Year 2020/2021 (2077/2078 BS)



Lahachowk 132 kV Substation

August 2021 (BHADRA 2078)  
Durbar Marg, Kathmandu, Nepal





MESSAGE FROM THE

## MANAGING DIRECTOR

It gives me great pleasure to pen these words for the Transmission Directorate and the Project Management Directorate's joint year book on the occasion of Nepal Electricity Authority's 36th anniversary. Transmission and Project Management Directorate together have been essential in bridging the growth in generation and distribution in Nepal. With the growing infrastructure within these directorates, we have been able to evacuate large amounts of power being produced or purchased in the country to anywhere within the rapidly growing electricity network which is the Integrated Nepal Power System (INPS).

Work in the field of transmission line can be exceptionally challenging especially this year with the Covid-19 pandemic still looming over us, but both the directorates have pulled through and I would like to congratulate the Transmission Directorate and PMD for yet another successful year adding 604.74 ckt. km and 2134 MVA. This fiscal year also marked the completion and inauguration of 400 kV Dhalkebar the first of its kind, marking the entry of Nepal in the Extra High Voltage 400 kV system. This has been regarded as a remarkable milestones in the Nepalese power system. The completion of Dana-Kushma 220 kV transmission line and 132 kV Samudratar -trishuli 3B hub transmission line in this year has also made the system robust. The long troubled Singati- Lamosaghu transmission line has also seen its 1st circuit completed this year.

I am also glad to note that work is ongoing in these directorates to [insert what has been going on in planning and system improvement/ upgradation sector].

Finally, I would like to congratulate the entire team behind this publication for their hard work to bring about this publication in time as is tradition. It is my belief that this book will provide valuable information about the hard but important work being done within these directorates to various stakeholders; and provide an insight into the workings of the directorates that help keep our lights on!

.....  
Kul Man Ghising  
Managing Director



## MESSAGE FROM THE

# CHIEF, TRANSMISSION DIRECTORATE

Transmission network serves as the backbone for transmitting bulk power from remote generating stations to the various distribution substations. Effective and efficient operation of integrated power system demands planned and timely construction of transmission networks and in NEA, these activities are under the purview of the Transmission Directorate and Project Management Directorate.

Encouraged from the positive feedback on the previous publication, NEA management has decided for its continuation and the current publication covers brief information on various transmission and substation projects being implemented for construction, upgradation and rehabilitation works, system information and the extreme effort laid by the Directorate to improve the stability and reliability of transmission network, in addition to regular operation and maintenance activities undertaken during the year under review.

The fiscal year 2020/21 AD (2077/78 BS) remained quite successful for the Directorate besides of challenges due to Covid-19 pandemic and loss of transmission assets at few locations. Transmission loss has remained at 4.64%. The transmission line projects namely long waited Singati-Lamosangu 132 kV Transmission Line (one circuit), Kushma-Lower Modi 132 kV Transmission Line and Khimti-Dhalkebar 220 kV Transmission Line (second circuit) has been put into operation and the Dhalkebar substation has been energized at 400 kV adding 115 circuit km length of transmission line and 945 MVA capacity in grid substations in the year under review. Similarly, many existing grid substations have been upgraded to enhance the grid capacity by 888.2 MVA. So, this year has observed an addition of 1833.2 MVA capacity in the grid. Similarly, 395.5 circuit km of transmission line has been constructed in this fiscal year.

Similarly, under this Directorate 1136 circuit km of 132 kV, 509 circuit km of 220 kV and 576 circuit km of 400 kV transmission line are under construction. Likewise, 1020 circuit km of 132 kV, 405 circuit km of 220 kV and 1090 circuit km of 400 kV transmission line are planned for construction in the years to come. Similarly, 4457 MVA of grid substation capacity worth of infrastructure is under construction and 2160 MVA is planned for execution in the coming FYs.

In the year under review, the Directorate also faced challenges to restore power supply in few areas because of damage to transmission assets due to heavy rainfall, land slide and flood. Four towers of Dordi Corridor 132 kV transmission line swept away, tower no. 9 of existing Middle Marsyangdi-Lower Marsyangdi 132 kV was damaged. However, with the use of ERS towers, the supply was restored quickly.

The GoN has come up with the strategy of building 15000 MW in 10 years and this necessitates building up transmission systems capable of handling such a huge quantum of power. The Directorate has come up with the planned and systematic efforts to

expand 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, upgrading the existing ACSR with HTLS conductor and upgrading the substation capacities wherever necessary to overcome the bottlenecks and meet the increasing power demand.

Load Dispatch Centre (LDC) being the system operator has performed quite satisfactorily in maintaining the demand-supply through optimal scheduling and dispatching of available generating stations and through import/export of power between Nepal and India, increasing power availability and maintaining shutdown coordination to keep the interruptions minimum. The system operation has become more effective and efficient after upgradation of Load Dispatch Centre (LDC) with the latest SCADA/EMS. Also, the establishment of an emergency / backup control centre at Hetauda is in final stage of completion.

I sincerely believe that this publication will enlighten NEA stakeholders about the efforts undertaken by Transmission Directorate to address the present situation of supply-demand mismatch 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.



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Dirghayu Kumar Shrestha  
Chief  
Transmission Directorate



## MESSAGE FROM THE

### **DEPUTY MANAGING DIRECTOR, PROJECT MANAGEMENT DIRECTORATE**

Project Management Directorate in Nepal Electricity Authority, has been implementing projects funded by Asian Development Bank (ADB) since last eight years. It is a matter of immense pleasure that this publication has provided an opportunity to introduce a wide range of projects being executed by PMD. Currently, PMD is overseeing various projects ranging from high voltage overhead & underground transmission line, high voltage substation, distribution line, distribution substation, grid tied solar project, substation automation, smart metering and distribution system undergrounding.

FY 2077/78 has been a successful year for PMD considering development of transmission infrastructures. 40 km of Dana-Kusma 220 kV Transmission Line and associated substations at Dana (220/132kV, 100 MVA; 132/33 kV, 25 MVA) and Kusma (220/132kV, 100 MVA) have been successfully completed. Similarly, 26 km of Samundratara- Trishuli 3B 132 kV double circuit line and associated substation (132/33 kV, 60 MVA; 33/11 kV, 16 MVA) has been completed and commissioned.

Similarly, a number of transmission line and substation projects are under construction and are at different stages of completion. 658 circuit km of 400/220/132 kV transmission line, 3537.5 MVA capacity of 400/220/132 kV substations, 212.2 MVA capacity of 33/11 kV substation, 2066 km of 33/11 kV overhead line, 840 km of 11 kV underground distribution line, 1894 km of 400 Volt overhead line and 1117 km of 400 volt underground line is being constructed in different provinces of Nepal under PMD. One 33/11 kV substations with capacity of 8 MVA was added in FY 2020/21 under PMD. Similarly total lengths corresponding to 33 kV, 11 kV and 400 V voltage levels completed under PMD in FY 2020/2021 are 105 km, 172 km and 430 km respectively. To increase the quality, reliability and access of electricity in province No. 2, contract has been signed in FY 2020/21 and survey works is going on for the electrification of Province No. 2.

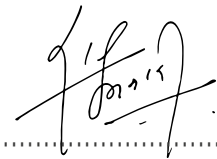
In order to ensure safety & reliability of electricity supply, underground cable laying works to upgrade the distribution system is underway in Kathmandu in Ratnapark, Maharajgunj, Kuleshwor, Kirtipur and Baneshwor distribution centers' areas. Distribution system undergrounding in Lalitpur and Bhaktapur has also been initiated. Outside Kathmandu valley, PMD has aimed to upgrade the distribution system and lay underground distribution cables in Pokhara and Bharatpur.

With the intention of adopting modern digital technology into its system to enhance its operational efficiency, reduce energy theft and enable itself to serve its consumers in a better way, smart grid and smart metering system has been introduced by PMD. Smart meter installation in areas under Ratnapark and Maharajgunj Distribution Centers has already begun and will be accomplished in first quarter of FY 2021/22.

Proper implementation of smart meters, Enterprise Resource Planning (ERP) and Substation Automation System is only possible with a Distribution Command and Control Center and Data Centre. The Distribution Command and Control Centre & Data Centre will be constructed at the premises of Load Dispatch Centre, Suichatar. Similarly, automation of grid substations will ensure controlled and systematic operation of the grid system. This will ultimately lead to reliable power supply and remarkable savings in the operation of grid substations. Installation of Substation Automation System (SAS) in thirteen (13) grid substation within the valley is underway and will be completed by FY 2021/22. Similarly, bid document preparation is going on for the automation of additional forty (40) grid substations in the country.

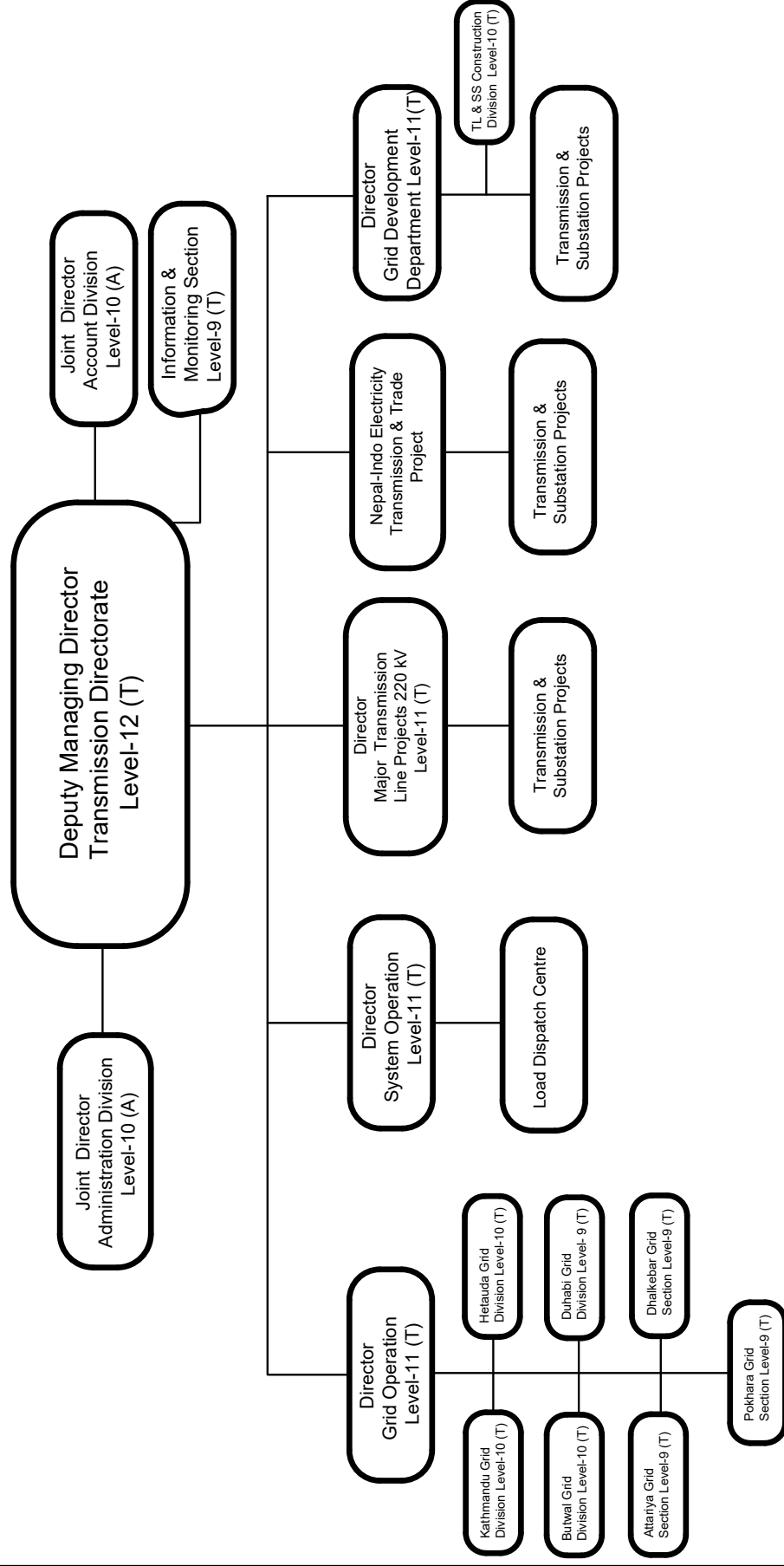
In order to keep in track the future need of infrastructures, PMD has been involved in detail engineering and environmental study of more than 1900 circuit km of 400 kV transmission line and associated substations, 290 circuit km of 132 kV transmission line and associated substations. Moreover, in order to ensure adequate transmission capacity to deliver required power in major cities of Nepal for the next 30 years, consultant has been recruited.

I would like to thank and congratulate the entire PMD staffs & project teams for keeping up the efforts despite the critical situation. Finally, my sincere gratitude & congratulations to the team in bringing out this publication.

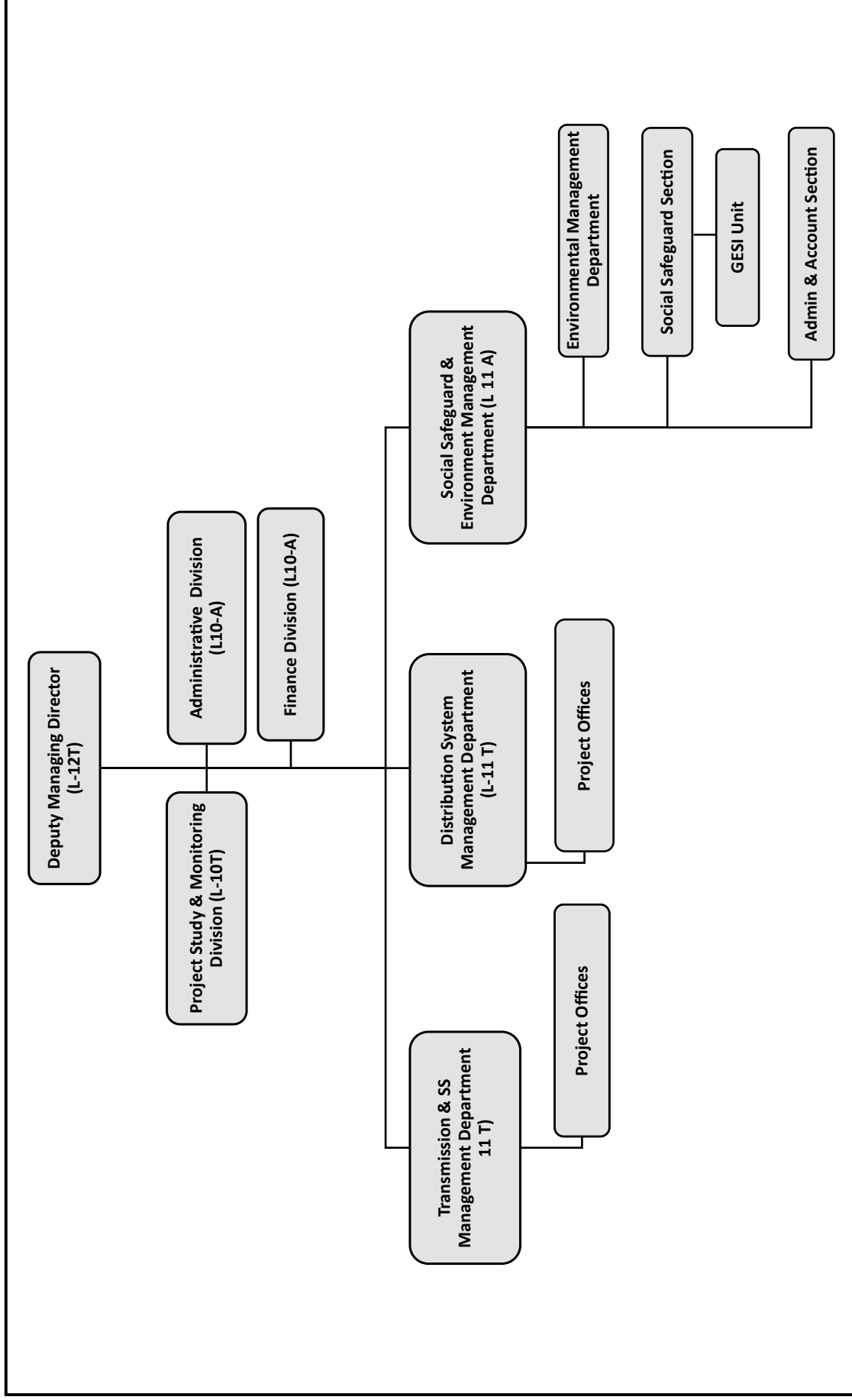


.....  
(Ramji Bhandari)  
Deputy Managing Director

# CORPORATE STRUCTURE OF TRANSMISSION DIRECTORATE



**PROJECT MANAGEMENT DIRECTORATE  
ORGANIZATION STRUCTURE**



## TRANSMISSION DIRECTORATE DIRECTORATE/ DEPARTMENT/DIVISION CHIEFS



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**Mr. Narayan Prasad Acharya**  
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## PROJECT MANAGEMENT DIRECTORATE DIRECTORATE/ DEPARTMENT/DIVISION CHIEFS



**Mr. Ramji Bhandari**  
Deputy Managing Director



**Mr. Tara Pd. Pradhan**  
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**Mr. Rajan Rishi Kadel**  
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**Mr. Ganesh Dutta Bhatta**  
Division Chief Finance



**Mr. Gopal Pathak**  
Division Chief Administration

# 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
IEX	Indian Energy Exchange

## 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

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# TRANSMISSION DIRECTORATE

Transmission Directorate is one of the nine directorates in the overall organizational structure of NEA, headed presently by the Chief Mr. Dirghayu Kumar Shrestha. The directorate is fully devoted to its responsibility of planning, developing, operating and maintaining high-voltage transmission lines and substations from 66 kV to 400 kV voltage level.

The transmission system imparts an important link between the power generated from various power plants being owned by NEA, IPP's and distribution networks ensuring the reliable and quality power to be supplied to the consumers. This directorate leads to develop and construct the new transmission lines and associated substations along with the work of reinforcement/upgradations of existing transmission lines and substations.

Grid Operation Department (GOD), System Operation Department (SOD), Grid Development Department (GDD), and Major 220 kV Transmission Line Department are the four departments under this directorate and each of them is headed by a Director. In addition, the major 400 kV Transmission Line Projects is also under this directorate.

## **The main objectives of the directorate are**

- To ensure the development and construction of efficient, coordinated and economical system of transmission lines from 66 kV to 400 kV voltage level for smooth flow of electricity from generating stations to the distant load centers.
- To operate, monitor and maintain the transmission system (66 kV to 400 kV voltage level) in an efficient manner.
- To ensure the quality and reliable power supply to consumers by reducing system outages and

continuous supervision of INPS.

- To envisage, formulate, and implement short term, medium-term and long term development plans of transmission system network of 66 kV and above voltage levels to evacuate the power generated as per the GoN strategy (15,000 MW in 10 years) as well as to serve the rapidly growing demand of the country.
- To reinforce/ up-grade the existing transmission lines and substations capacity.

Now the INPS system has been energized to a maximum of 400 kV voltage level. Dhalkebar substation has been energized to its full capacity allowing Dhalkebar-Muzaffarpur line to put into operation at 400 kV on November 11, 2020. Being the major hub for power exchange between Nepal and India, the substation assist in the process of importing power and help to meet the increasing demand for electricity in Nepal. Furthermore, it is facilitating the export of electricity to India when Nepal's capacity generated is surplus to demand. Now onwards all the new substations will be equipped with a state-of-the-art control, protection and automation system based on IEC 61850 protocol.

The directorate has responsibility to operate INPS in synchronous mode with Indian Grid to make the system reliable, secured, and robust in the future. Moreover, this directorate is also responsible for power exchange across border countries through cross-border transmission lines. The first-ever 400 kV Dhalkebar-Muzaffarpur cross-border transmission line has played a central role in the strengthening of the transmission network of INPS. Also, preparation of financial and implementation modality for the construction of the Butwal-Gorakhpur 400 kV cross-border transmission line is in the final stage. Similarly, the preparation of the comprehensive design of 400 kV

Inaruwa-Purniya and New Lumki (Dododhara) - Bareli cross border transmission lines are in progress.

## RECENTLY COMPLETED PROJECTS

### 1. Kabeli Corridor 132 kV Transmission Line

The project was started with the objective of evacuating power generated from Kabeli, Hewa, Mai and other river basin HEPs of eastern region. Cost of the project was approximately US\$ 31 Million and funded by WB, GoN, NEA.

The first section comprising of 35 km transmission line from Damak to Godak and associated substations at Damak and Godak was commissioned long back on 19th Ashoj, 2072 and has been very useful to evacuate power from Sanima Mai Khola cascade (29 MW), Mai Cascade (18.0 MW), Himal Dolkha cascade (12.0MW) and more projects to INPS. The second section comprising of 42.659 km of transmission line from Godak to Phidim (Thapatar) substation was completed and charged on 24th Baishak 2076 (7th May 2019) and has been useful evacuating power from Upper Hewa Khola A (14.9MW) and Lower Hewa Khola (22.5MW). The third section comprising of 13.334 km of transmission line from Phidim (Thapatar) to Amarpur (Kabeli) substation had been commissioned on 20th Shrawan 2076 (6th August 2019) and has been useful evacuating power from Kabeli B (25MW), Iwa Khola (10MW) and Phawa Khola (5.2MW).

Finally, the remaining second 132 kV line bay extension works at Amarpur substation has been completed this year and charged on 5th Ashadh 2078.

Construction of transmission line from Damak to Kabeli and associated substations has helped to cater the increasing electricity demand of Damak area, evacuate power from IPP projects in the eastern region, relieve Anarmani substation and improve quality of power supply situation in the eastern part of the country.



*Bay Extension at Amarpur Substation*

### 2. Singati-Lamosangu 132 kV Transmission Corridor

Objective of this project was to evacuate power from hydropower projects being developed by IPP's in the Tamakoshi and Singati basin. The project was started in FY 2065/66 (2008/09). The total cost of the project is about US\$ 13.0 million and funded by GoN.

The overall scope of the project includes construction of 40 km double circuit Singati-Lamosangu 132 kV transmission line with ACSR Bear conductor, 132/33kV, 30 MVA substation at Singati and 132 kV bay extension works at Lamosangu substation.

The entire 126 tower foundations, tower erections and 1st circuit conductor stringing works have been completed. One circuit has been charged on Ashadh 31, 2078 (July 15, 2021). About 25 km conductor stringing in the 2nd circuit and major civil, equipment installation works at Singati have also been completed. Second circuit line and Singati substation will be commissioned soon.



*132 kV Tower*

### 3. Kusma-Lower Modi 132 kV Transmission Line

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

The Project has completed the construction of 6.2 km 132 kV single circuit transmission line from Kusma to Lower

Modi HEP and 132 kV bay extension works at Lower Modi. The transmission line has been successfully charged on February 4, 2021 and put into operation.



*Bay Extension at Lower Modi HEP*

#### 4. Khimti – Dhalkebar 220 kV Transmission Line

The Khimti-Dhalkebar 220 kV transmission line is essential in evacuating the power generated from the Upper Tamakoshi Hydropower Project as well as evacuating power from IPPs projects of Likhu corridor. This line directly links the northern Tamakoshi region to southern load centre of Nepal. Objective of this project is to enhance the transmission capacity, improve supply reliability, reduce loss and improve voltage profile in the national grid.

The project scope of works include construction of 75 km long double circuit transmission line with twin Bison conductor. The project was jointly funded by World Bank, GoN, and NEA. The estimated cost was US\$ 22 Million.

The construction of all the double circuit towers along with the first circuit stringing had already been completed and charged (initially at 132 kV) back on January 17, 2017. The stringing of second circuit was started in year 2013 with the estimated cost of US\$ 2.5 million. Although, the project has been much delayed due to the strong protest from the local people, still the second circuit has been successfully charged at 220 kV on June 30, 2021 and this line has been very useful for evacuating power from Upper Tamakoshi HEP to Dhalkebar substation from July 05, 2021.

**Comparison of Transmission Line Length in last Seven 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	3989.50	606
6	2076/077	514	3240	437	78	4269	279.50
7	2077/078	514.00	3540.54	741.20	78	4874	604.74

**Comparison of Substation Capacity in last Seven 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
6	2076/077	4299.70	364.40
7	2077/078	6433.90	2134.2
<b>Total</b>			<b>4302</b>

**Comparison of Capacitor Bank Capacity in last Seven Fiscal Years**

S.N.	FY	Total Capacity (MVar)	Total Increment (MVar)
1	2071/072	443.644	
2	2072/073	463.644	20
3	2073/074	473.644	10
4	2074/075	473.644	0
5	2075/076	516.144	42.5
6	2076/077	546.144	30
7	2077/078	643.644	97.5
<b>Total</b>			<b>200</b>

The details of existing, under construction, plan and proposed high voltage transmission lines and substations that are being executed by different Departments under this Directorate are presented in Annexure B.

## I. GRID DEVELOPMENT DEPARTMENT

This department is headed by a Director and is responsible for planning, constructing, supervising and commissioning of new transmission line and substation projects up to 132 kV voltage level.

Brief summary of the projects being executed by this department are presented below:

### PROJECTS UNDER CONSTRUCTION

#### 1. Hetauda-Birgunj 66 kV Transmission Line Upgradation

At present, Hetauda-Birgunj 66 kV double circuit transmission line with ACSR Wolf conductor is supplying power to small and medium scaled industries like Hetauda Cement, Hulas Steel, Jagadamba steel, Surya Nepal, Ashok Steel. The quantum of power required by these industries and associated substations is increasing day by day. To address the problem of low current carrying capacity of existing ACSR Wolf conductor, this project was initiated with the objective of replacing existing Wolf conductor with High Temperature Low Sag (HTLS) INVAR conductor. Estimated project cost is US\$ 3 Million and funded by GoN. Project started in FY 2072/073 (2015/016) and as per the revised schedule, it is expected to commission on December, 2021.

Project scope of works includes replacing 20.20 km Wolf conductor with HTLS conductor and associated hardware from Simara tower no 276 to Birgunj substation via Parwanipur substation.

Detail survey of the existing 66 kV transmission line from Simara (tower no 276) to Birgunj substation (tower no 353) has been completed. It is estimated that 43 tower insertions are required to achieve minimum ground clearance at maximum operating temperature of HTLS conductor. As of July 2021, 27 number of foundation works from Simara to Parwanipur section have been completed and 43 number of Tower parts including HTLS INVAR Conductor and its fittings have already reached at site. Re-conductoring works of HTLS conductor shall be started from August 2021.

#### 2. Ramechhap (Garjyang) -Khimti 132 kV Transmission Line

Objective of this project is to evacuate the power generated

by IPP projects in Khimti and Likhu Corridor. The Garjyang-New Khimti transmission line, Garjyang substation and line bays at New Khimti started in FY 2067/068 and the New Khimti 220/132 kV, 200 MVA transformer installation and other associated works started in FY 2076/77 and these are expected to be completed by the end of FY 2078/079. The estimated total project cost is US\$ 20 Million, which is funded by the GoN.

#### The scope of works include:

- Construction of 31 km 132 kV of double circuit transmission line with ACSR Bear conductor as well as 132/33/11 V new substation with 132/33kV 30 MVA 3Φ power transformer and 33/11kV 3Φ 6/8 MVA power transformer at Garjyang and construction of 132 kV bays at New Khimti Substation. For this work contract was signed in February 2017 with Pinggao Group Co. Ltd
- Extension of 220 kV GIS at New Khimti substation with 1 no. of 220 kV bay for connecting 220/132 kV, 200 MVA (4\*66.67 1Φ) bank of autotransformers as well extension of 132 kV at New Khimti substation with 3 nos. of 132 kV bays and construction of 33 kV Indoor system with 8 nos of 33 kV bays. For this work, contract was signed in March 2020 with MSIPL-CHINT J/V.

As of July 2021, 104 tower foundations and 87 tower erections out of 105 have been completed, transmission line materials (conductors, insulators, tower parts) have been reached at site, 1.5 ckt km of transmission line has been strung, civil construction works such as control building, transformer foundation, gantries foundation etc. have already been completed at Garjyang substation. Power transformers have already reached at site. Preparation of land details for Right of Way has been started by the Dolakha and Ramechhap District Survey Department respectively after which the RoW compensation shall be decided from District Administration office and distributed.

In New Khimti substation, Upper Tamakoshi Hydropower Project has already installed 220/132 kV, 100 MVA power transformer to evacuate power from IPP's of Likhu Corridor. However, its capacity is found insufficient to evacuate the power from IPP's of Likhu and Garjyang corridor, so NEA decided to install additional 220/132/33 kV, 200 MVA power transformer at New Khimti under New Khimti Augmentation as part of Ramechhap, Garjyang, Khimti 132 kV Transmission Line Project. .

**Garjyang Substation****Transmission Tower at Garjyang**

### 3. New Modi-Lekhnath 132 kV Transmission Line

The project is initiated with the objective of improving power supply situation in Dhaulagiri zone and evacuating power from hydropower projects in Modi river basin of Parbat and Seti-Mardi-Sardi river of Kaski district. Cost of the project is about US\$ 21.0 Million and jointly funded by EXIM Bank of India and GoN.

Overall scope of the project includes construction of 43.28 km 132 kV double circuit transmission line with ACSR Bear conductor which shall connect existing Modi HEP with Lekhnath substation through proposed New Modi & Lahachowk substations. It will also construct 132 kV Switching substation at Korunga (New Modi) and 132/33kV, 30MVA substation at Lahachowk.

The substation contract has been awarded to M/S ABB India Ltd on 21st June 2018. The contractor has completed almost 99% of the substation works. The equipment testing and commissioning work from contractor side has been completed but due to delay in transmission line, the substation couldn't be charged.

The transmission line contract has been awarded to M/S Kalpataru Power Transmission Limited on 21st June 2018. As of July 2021 check survey of 42.5 km line, land profiling, tower schedule, cadastral land survey have been completed. About 89 nos of stub foundation works has been completed and stub foundation works are ongoing in 6 nos of location. 78 nos of Tower has been erected and 17.746 km of line stringing has been completed. On supply part, almost all equipment except aviation lights has been delivered in site store. Land acquisition for transmission line is one of the most challenging work in this project. People's resistance to works, demand for shifting of line from the existing route, demand of very high compensation for RoW has severely delayed the project. As a whole, about 53.7 percent of transmission line construction work has been completed.

**New Modi Substation**

### 4. 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 is initiated in FY 2067/068 (2010/11) and expected to be completed by December 2021.

Scope of this project includes 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 132/33kV, 30 MVA and 33/11kV, 8 MVA Tingla substation at Dudhkunda Municipality of Solukhumbu district.

All the works at 132/33/11 kV Tingla substation has been completed and substation is charged. 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 302 towers, 299 towers foundation work and 291 tower erection works

have been completed and 84 km line has been completed. In spite of strong protest for rerouting of transmission line at Maruwa, Katari municipality and RoW issues at various locations, with the support of Administration and security forces, construction works has been started at Maruwa.

### 5. Thankot – Chapagaon – Bhaktapur 132 kV Transmission Line

The project is initiated with the objective of completing 132 kV ring main in Kathmandu valley to improve the power transmission capacity, power quality, reliability and reduce line loss in the valley. The initial project cost estimate was US\$ 23 million and project was jointly funded by ADB and OPEC, GoN and NEA.

About 6 km transmission line in Kathmandu district and 4 km transmission line in Bhaktapur district have been completed. Construction of remaining 18 km transmission line in Lalitpur district was stopped due to protest by local people demanding 100% RoW compensation or complete shift of transmission line and consequently previous contract was terminated. NEA is taking initiations and conduct dialogs with concerned people and authorities to complete the remaining works.

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

Objective of this project is to construct the transmission line from Kapilvastu to Arghakhachi, Gulmi and Banglung districts to improve the power supply situation, reduce faults in distribution system, evacuate power from IPP plants, and decrease the technical loss. The estimated cost of the project is around US\$ 30 Million and funded by GoN. This project was initiated in FY 2065/066 (2008/09) and is expected to be completed by 2021/22.

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

NEA has signed contract agreement for all the works and for all contracts, Contractor has mobilized to the site. As of July 2021, civil construction works of office building, control building, guard house and store building in Motipur & Sandhikharka substation has been completed. Construction works of Tamghas, Paudi-Amarai, Burtibang substation have been started. Regarding Motipur-

Sandhikharka 132 kV transmission line, all the 114 tower foundation works and 55 tower erection works have been completed and for Sandhikharka-Tamghas Paudi-Amarai Burtibang 132 kV transmission line, check survey, geotechnical investigation, tree counting and 2 tower foundation have been completed.



**Motipur Substation**



**Sandhikharka Substation**

### 7. 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.

Scope of the project includes construction of 10.167km 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 2021, all major works of Kirtipur 132/11kV substation has been completed, but due to unavailability of 132 kV voltage level supply, the substation is yet to be commissioned. Regarding Kirtipur-Udipur 132kV transmission line, foundation works as well as tower erection and stringing works of conductor and OPGW were completed except in one span (from AP0 to AP0A) since it requires shutdown of Bhulbhule – Middle Marsyangdi 132kV Transmission Line. However, due to heavy rainfall and devastating flood at Dordi river in Asadh 2078, total 4 (four) nos. of transmission tower has been collapsed affecting the completion schedule of project. Survey works for reconstruction of collapsed tower has been completed and after acquisition of land for tower foundation, reconstruction works shall be started soon.



**Kirtipur 132/11 kV Substation**



**Kirtipur – Udipur 132 kV Transmission Line**



**Collapsed Tower**

## 8. Kushaha (Inaruwa) - Biratnagar 132 kV Transmission Line

The objective of this project is to reinforce the power supply system of Morang and Sunsari district to meet the increasing power demand of domestic, commercial and industrial consumers as well as to minimize overloading problem of existing Duhabi Grid Substation, 33/11 kV Rani Substation and 33/11kV Tankisinwari Substation. 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 April 2022.

Scope of the project includes construction of 23 km, 132 kV double circuit transmission line with HTLS Cordoba Conductor from Inaruwa 400/220/132 kV Substation to Biratnagar Substation with 132/33kV, 2\*63MVA and 33/11kV, 16MVA Power Transformers at Ramganj Belgachiya.

As of July 2021, regarding Biratnagar substation, 90% of control buildings construction works, 50% of switchyard foundation works and 80% of staff quarter construction works have been completed. Switchyard equipment such as disconnecting switches, CRP SAS Panels, Communication equipment have been delivered to site.

Regarding transmission line, check survey of 22.504 km line, land profiling, tower scheduling, soil investigation work and cadastral land survey have been completed. The notice for land acquisition of tower pad has been published. Structural design and drawings of all tower types as well as foundation design and drawings of all tower types have been approved.

## 9. Butwal-Lumbini 132 kV Transmission Line

The project has been initiated with the objective of enhancing transmission capacity, improving power quality, and reducing line loss in Rupandehi district. The cost of project is estimated to be USD 9.5 Million and funded by GoN. The project is initiated in FY 2070/071(2013/14) and is expected to be completed by the end of year 2021.

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

As of July 2021, in substation all the civil construction works

including staff quarter, control building, erection of steel structures has been completed. All substation equipment except power transformers have been delivered to site. Regarding transmission line, construction of 56 out of 57 tower foundation works has been completed, land acquisition process for tower Pad has been completed, RoW compensation work is in progress. ACSR Bear conductor, XLPE cable and accessories for underground have been delivered to site.

#### 10. Chameliya- Syaule- Attariya 132 kV Second Circuit Transmission Line

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 132kV 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 in this fiscal year.

As of July 2021, 124.5 km of stringing works has been completed. Bay extension work at Chameliya s/s has been completed. And bay Extension works at Attariya and Syaule substations has progress of around 80%. Steel lattice structure has been delivered to the site and laying of foundation work is in progress.

Local residents nearby tower no. 13 to tower no. 17 of Darchula district have forced to halt conductor stringing work demanding insertion of additional towers. Further, local residents nearby tower no. 194 to tower no. 212 at Dadeldhura district have created obstruction for conductor stringing demanding for compensation for household structures under RoW which was constructed after the completion of first circuit.



**Bay Extension work at Attariya 132 kV Substation**

#### 11. Bardghat - Sardi 132 kV Transmission Line

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 the end of year 2021.

As of July 2021, in substation all the civil construction works including staff quarter, control building and foundation works has been completed. Major substation equipment have been delivered to site. Regarding transmission line construction of 65 out of 67 tower foundation, 50 tower erection and around 13 circuit km of stringing works has been completed, land acquisition process for tower pad has been completed, RoW compensation distribution work is in progress and major equipment including tower materials, conductor, Insulators and hardware & fittings except OPGW has been delivered to site. Multiple gangs for tower erection and conductor stringing are working at the site to complete the project at the earliest.



**Ongoing Tower Erection Works**



**Ongoing Conductor Stringing Works**

## 12. Kushaha- Kataiya 132 kV Second circuit Transmission Line

Considering surplus power in Nepal and high demand in India during wet season and vice versa in dry season, Nepal and India government have agreed to construct cross border transmission line for import/export of power. Kushaha-Kataiya 132 kV second circuit transmission line project is proposed for further strengthening of Nepal-India power trade. The estimated cost of the project is US\$ 5.5 Million and funded by GoN.

The Scope of this project includes construction of 16.5 km second circuit transmission line on same double circuit tower of existing Kushaha-Kataiya 132 kV transmission line and upgradation of existing Kusaha switching station to full phase substation with 132/11kV, 22.5 MVA Power Transformer and necessary 132 kV line bays to connect transmission lines from Rupani, Duhabi and Kataiya substations.

NEA has signed contract agreement with Sigma Con - Narendra Nirman JV on September 19, 2019 (18 month Contract) for all the works and Contractor has mobilized to the site..

As of July 2021, all the civil and electrical design drawings and equipment drawings have been approved except

CRP and SAS. Transformer and gantry foundation have been completed and switchyard construction work at Kushaha substation is ongoing. Moreover, control building foundation has been completed and the works up to plinth beam is ongoing. The 22.5 MVA 132/11 kV transformer, Instrument transformer, tower structures/ parts & stubs, conductors, insulators and hardware fittings for LILO works have been delivered at site and LA and DS shall be delivered to site soon as they are in the custom. Other equipment such as CB, battery and battery charger are ready for dispatch from manufacturer premises. Furthermore, stringing of 12 km second circuit line with ACSR Panther conductor has been completed out of total 12.5 km line. Land acquisition has been completed for LILO towers and foundation of tower started at location AP 03. The project is expected to be completed in February 2022.

## 13. Nawalpur 132/33 kV Substation

Objective of this project is to strengthen the power supply system and improve power transfer capacity to meet increasing demand of Sarlahi district. The estimated cost of the project is US\$ 6.9 Million and funded by GoN. The project is initiated in FY 2074/75 (2017/18) and expected to be completed by the end of year 2021.

Scope of the project includes construction of Nawalpur Substation with power transformer capacity of 132/33kV, 63MVA and 33/11kV, 16 MVA. It will also construct 10 km double circuit 33 kV sub transmission line from Nawalpur substation to existing Haripur 33/11 kV substation to supply power to that substation.

As of July 2021, construction of the substation works have almost been completed. All the equipment have been installed. Relay setting and testing of Control and Relay Panel is in progress. Erection of 132 kV dead end LILO towers is in progress.



**Nawalpur 132 kV Substation**

#### 14. Sunwal 132 kV Substation

The objective of this project is to supply power to Palpa cement, Laxmi Steel and local industries around Nawalparasi district and improve the reliability, voltage profile as well as power shortage in both Nawalparasi and Rupandehi district.

For this project the fund has been allocated by the GoN through Ministry of Industry, Commerce and Supplies and the cost of Project is NRs 690 million. The contract agreement has been signed on September 2019 with Energy Pac and Sigma Con JV on September 2019. This project contract work was effective from November 10, 2019 and to be completed on 10 August 2021. As a consequence of Covid pandemic, there has been delay in work completion date. The project is expected to be completed by the end of March 2022.

The scope of work under this project include construction of 132/33 kV, 2\*63.5 MVA and 132/11 kV, 1\*22.5 MVA substation. There will be 7 numbers of 33 kV feeders and 3 numbers of 11 kV feeder for distribution.

As of July 2021, construction of boundary wall and store cum guard house have been accomplished. Construction of control building, switchyard foundation and staff quarter are under progress, whereas electrical designs are under review and most of them have been approved.



*Sunwal Substation*

#### 15. Balefi-Barhabise Corridor 132 kV Transmission Line

This project has been initiated with the aim 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. Initial cost estimate of the project is NRs 546.69 Million and funded by GoN. The contract agreement has been signed with M/s Sigma Con.Pvt Ltd on May 2020 and the project is expected to be completed by July 2022.

As of July 2021, check survey, detail engineering, resistivity measurement and soil test works are in progress.

#### 16. Kohalpur-Surkhet-Dailekh 132 kV Transmission Line

Objective of this project is to meet the increasing power demand of Surkhet and Dailekh districts, improve power supply quality 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 double circuit transmission line with ACSR Bear conductor, 31 km Surkhet-Dailekh 132 kV double circuit transmission line with ACSR Bear conductor, 132 kV bay extension works at Kohalpur and 132/33 kV substation at Dailekh. Estimated project cost is US\$ 23 Million and is funded by GoN. The transmission line package from Kohalpur to Surkhet has been awarded to M/S M/s RS Infraprojects Pvt. Ltd. and this section of the line is expected to be completed by Ashad 2079.

As of July 2021, in Kohalpur-Surkhet 132 kV section; detail/check survey, soil Investigation works and tree counting on RoW have been completed. Tower design, foundation design, tower schedule works have also been completed and Notice for acquiring private lands on Banke and Surkhet district for tower pads have been published. EIA implementation and approval for tree cutting is under process. Similarly, in Surkhet-Dailekh 132 kV TL section; land acquisition for Dailekh substation has been completed and IEE is in final stage of approval. In addition, for 132 kV bay extension at Kohalpur, bid document is ready for floating the tender.

#### 17. Bhaktapur-Baneshwor-Patan 66kV Transmission Line Up-gradation

The project has been initiated to upgrade the existing power supply system of Lalitpur and Kathmandu districts through up gradation of the existing conductor of 66 kV transmission lines in Kathmandu Valley. The scope of project includes replacement of 20 km existing ACSR LGJ 120 sq. mm Chinese conductor and ACSR Wolf conductor from Bhaktapur to Suichatar substation via Baneshwor and Patan substations and 5 km existing ACSR Dog conductor between Chapali and Chabahil substations with High Temperature Low Sag (HTLS) conductor. Estimated cost of the project is US\$ 2.5 Million and funded by GoN. This project is started on FY 2074/075 (2017/18) and expected to be completed by 2021/22.

As of July 2021, HTLS conductor stringing in Bhaktapur-Baneshwor 66 kV line (around 11 km) is under progress and expected to be completed by August 2021 . After

completion of Bhaktapur-Baneshwor section, stringing works for remaining section i.e. Baneshwor-Patan and Patan-Suichatar 66 kV line will be started. Supply of HTLS Conductor and Hardware Fittings for Chapali- Chabahil 66 kV line is ongoing.



*Conductor Stringing Works*

#### 18. Mainahiya - Sampatiya 132 kV Transmission Line

Objective of this project is to facilitate cross-border power trade between Nepal and India. 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 substation (Nepal) and Sampatiya substation (India). The cost of project is estimated to be US\$ 8 million and funded by GoN. The project is initiated in FY 2075/076(2017/18) and is expected to be completed by the year 2022/023.

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

As of July, 2021 IEE has been approved and the construction license has been issued. Construction of 14 out of 95 tower foundation works has been completed. Land acquisition process for tower Pad is in progress.

#### 19. Lamahi Ghorahi 132 kV Substation Expansion

Objective of this project is to supply adequate power 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.

For this project the fund has been allocated by the GoN

and the cost of Project is NRs 259 million. The contract agreement has been signed on June 2020 with M/S Hightension Switchgears Pvt. Ltd, Kathmandu Nepal. This project is initiated in FY 2076/77 (2019/20) and expected to be completed on February 2022.

Scope of the project include installation of one number of 132/33 kV, 63 MVA transformer, two numbers of capacitor banks of 12.5 MVAR and 20 MVAR with necessary bay and bus bar arrangement, control and protection works at existing Ghorahi substation and bay expansion works at Lamahi 132 kV substation.

As of July 2021, construction of civil foundation are almost finished and approval of design of all major electrical equipment have been completed. Major equipment like 132 kV circuit breaker, 132 kV and 33 kV disconnecting switches are delivered at site. Online inspection of 33 kV circuit breaker and 33 kV, 12.5 and 20 MVAR capacitor bank has been completed.



*Transformer Foundation at Ghorahi*

#### 20. Dhalkebar- Loharpatti 132 kV Transmission Line

Objective of this project is to reinforce the power supply system, cater increasing power demand, improve quality and reliability of power supply of Mahottari and Dhanusha districts.

Scope of project includes construction of 20 km long 132 kV double circuit transmission line with ACSR Cardinal Conductor from existing Dhalkebar substation to Loharpatti with 132/33 kV, 2\*30 MVA and 132/11 kV, 22.5 MVA substation at Loharpatti. The estimated cost of the project is NRs 1125 Million and is funded by GoN. The project was started on February, 2021 and expected to be completed in 2023.

As of July 2021, construction of boundary wall is in final stage. Detail survey of transmission line has been

completed and check survey, soil test and cadastral survey are in progress. Design of transmission line and substation are in progress.

## 21. Pokhara –Lekhnath 132 kV Transmission Line Up-gradation

Objective of this project is to reinforce existing power supply system of Pokhara Metropolitan City of Kaski district by upgrading the conductor of existing Pokhara – Lekhnath 132 kV transmission line. It also helps to supply quality, reliable and uninterrupted power supply in Pokhara. The scope of project includes replacement of 7 km existing ACSR Wolf conductor from Pokhara to Lekhnath substations with High Temperature Low Sag (HTLS) conductor. Estimated cost of the project is US\$ 0.5 Million and funded by GoN. This project is initiated on FY 2077/2078(2020/2021) and expected to be completed by 2021/22.

As of July 2021, contract has been signed on June 2021 for replacement of conductor from Pokhara to Lekhnath within nine months period. Detail survey works by the Contractor is being completed.

## PROJECTS UNDER PLANNED AND PROPOSED

### 1. Raxaul Parwanipur 132 kV Second Circuit Transmission Line

Raxaul-Parwanipur 132 kV second circuit transmission line project has been initiated for increasing import/export of power between Nepal and India. This line will be helpful to meet increasing industrial demand of Birgung corridor.

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 Parwanipur substation. Estimated cost of the project is US\$ 1.5 Million and funded by GoN.

As of July 2021, tender has been floated for construction of 132 kV second circuit transmission line from Parwanipur s/s to Nepal-India border and 132 kV bay extension at Parwanipur substation in a single package. Technical and Financial Evaluation of the bidder's proposal has been completed. Contract agreement with the lowest evaluated bidder will be executed soon.

### 2. Dhalkebar – Balganga 132 kV Transmission Line

Objective of this project is intended for the voltage improvement, adequate and reliable power supply system

in 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 kV, 2x63 MVA substation at Balganga, Hansapur Municipality – 9. 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.

As of July 2021, the IEE report has been approved by Department of Electricity Development. The land acquisition for the substation has been completed. Civil work of the boundary wall and guard house with store at Balganga substation has been awarded and the bid preparation for transmission line and substation work is under progress.

### 3. Sunwal (Bhumahi) – Hakui 132 kV Transmission Line

Objective of this project is to meet the increasing industrial power demand in Bumahi – Bhairahawa Corridor of Nawalparasi (Susta Pachim), enhance the transmission capacity, improve supply reliability, reduce loss and improve voltage profile of distribution system in Nawalparasi.

Scope of the project includes construction of 14.4 km long 132 kV double circuit transmission line from Sunwal 132 kV substation (under construction) to new 132 kV substation in Hakui with ACSR Bear conductor. The new 132/33/11 kV substation shall be constructed at Hakui with 132/33 kV 2x63 MVA power transformer and 6 Nos of 33 kV feeders.

As of July 2021, detail survey for 132 kV transmission line route has been completed. Approval of IEE study is in final stage. Land acquisition for Hakui substation has been completed.

### 4. Kaligandaki-Ridi 132 kV Transmission Line

Objective of this project is to increase the quality of power supply in Palpa, Gulmi, Arghakhanchi and Syangja district. In addition, NEA will supply power to CG Cement after the completion of Ridi 132 kV substation. 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 single circuit transmission line on double circuit tower,



132/33/11 kV substation at Ridi and 132 kV bay extension works at Kaligandaki HEP.

As of July 2021, detail survey works for transmission line and land acquisition for Ridi substation have been completed. IEE report has been submitted to Department of Electricity Development (DOED) for approval.

#### 5. Amarpur-Dhungesaghu 132 kV Transmission Line

Objective of this project is to interconnect the Kabeli corridor and Koshi corridor so that the power from Kabeli corridor 132 kV can be partially diverted to the Koshi corridor 220 kV transmission line Project. This project shall be a link for evacuation of power effectively from the growing number of IPPs in the Kabeli river basin. Project is initiated on FY 2075/76 (2018/19) and it is expected to complete within two years from the start of construction activities with an estimated cost of the project is NRs. 82.2 crores and funded by GoN.

Scope of project includes construction of about 19.2 km double circuit transmission line from Amarpur, Panchthar to Dhungesaghu, Taplejung and necessary 132 kV bay extension works at respective substations.

As of July 2021, feasibility study of the project is in final stage. Initial Environmental Examination (IEE) for the project being done through ESSD of NEA is in stage of approval.

#### 6. Lalbandi-Salimpur 132 kV Transmission Line

Objective of this project is to enhance the quality and reliability of electricity supply in southern part of Sarlahi district. After construction of substation at Chainpura (Salimpur), it will feed power to Dumariya, Malangawa and Barathawa 33/11 KV substations. The estimated cost for the project is US\$ 12 million and funded by GoN. This project was initiated in FY 2074/075.

The scope of project include the construction of about 19.85 km long double circuit 132 kV transmission line with Bear conductor from under construction Nawalpur (Lalbandi) substation to Chainpura (Salimpur) and construction of 132/33 KV, 63 MVA and 33/11 kV, 16 MVA AIS substation at Chainpura.

As of July 2021, Land acquisition for construction of substation at Chainpura, Sarlahi has been completed and detail survey of transmission Line as well as tower spotting has also been completed. The survey license for the project is renewed by Department of Electricity Development (DoED). The IEE study for the project is in

final stage through the ESSD of NEA. The tender work for construction of boundary wall, guard house with store is completed and LOI has been issued.

#### 7. Godak – New Anarmani Transmission Line

Objective of the project is to improve quality and reliability electricity supply in Anarmani and surrounding areas of Jhapa district. The 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 2021, detail feasibility study of transmission line is under progress.

#### 8. Pathlaiya – Harniya Transmission Line

The objective of this project is to enhance the power supply system in Bara and Rautahat district. After completing the project, the power supply system in Kalaiya, Simraungadh, Harniya, Haraiya and south-west part of the Rautahat district shall be improved in reliability, capacity and security perspectives. The project is initiated in FY 2075/076 and funded by GoN.

The project comprises of about 30 km long 132kV double circuit transmission line with Bear conductor. The transmission line shall originate from the Piluwa 132kV Substation and connects the proposed Harniya 132 kV substation at Adarsha Katwal Rural Municipality, Bara.

As of July 2021, feasibility study and the environmental study is under progress. Land for the substation has been identified and land acquisition process will be initiated soon.

#### 9. Sunkoshi 132 kV Substation (Barhabise-Lamosangu 2nd Circuit)

Sunkoshi 132 kV Substation Project was conceptualized to connect the existing Lamosangu 132 kV substation with under construction Barhabise 220/132 kV substation at Sindhupalchok district. This project is initiated on FY 2075/076 (2018/19) and funded by GoN.

Scope of the project includes 12 km single circuit stringing with Bear conductor on existing double circuit transmission line towers, expansion of two 132 kV line bays at Barhabise substation and one 132 kV line bay at Lamosangu substation.

## 10. 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 Interconnected Nepal Power System(INPS). The project cost is estimated at US\$ 18 Million.and funded by GoN. This project is initiated on FY 2075/076 (2018/19).

The project comprises of construction of about 75 km long 132 kV double circuit transmission line from Khungri substation (Rolpa) to Uttarganga substation Hub, Bafikot (Rukum) along with one 132/33 kV substation at Ghartigaun, Rolpa.

As of July 2021,detail survey of the line route has been completed. Initial environmental examination (IEE) works is ongoing and about to finish by fiscal year 2078/79. Land acquisition for the substation at Ghartigaun, Rolpa is executed. Preparation of tendering works is planned to execute simultaneously by FY 2078/79.

## 11. New Pokhara (Birauta) 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. This project is initiated on FY 2075/076 (2018/19).

Scope of the project includes construction of 132/11 kV, 30 MVA GIS substation at Pokhara Metropolitan City ward no 17 in NEA owned land. The substation will be connected to existing Syangja- Lekhnath 132 kV transmission line through LILO arrangement and construction of 600 m 132 kV underground cable from substation to the termination tower. Project scope also includes construction of 11kV outgoing feeders up to the suitable connection point to enhance the capacity of existing feeders.

As of July 2021,detail survey of the line route has been completed and Terms of Reference (ToR) for Initial environmental examination (IEE) works has been submitted to DoED for approval.

## 12. Godak-Soyak 132 kV Transmission Line

Project is conceptualized to make LILO arrangement in second circuit Damak-Phidim transmission line and to connect with existing Godak132 kV substation. The purpose of the project is to improve the grid stability.

Scope of the project comprises of construction of 6.56

km 132 kV double circuit transmission line with Bear conductor. As of July 2020, draft feasibility study report is received from Project Development Department, NEA. The ToR of IEE is approved by DoED and final report of IEE is under progress.

## 13. Lahan - Sukhipur 132 kV Transmission Line

This project is focused on the development of transmission line to cater loads of 33/11 kV substations and improve voltage in Siraha district as well as to develop the power transmission line link to Sukhipur substation, south east region of Siraha district.

Scope of the project includes construction of about 17 km long; double circuit 132 kV transmission line with Bear conductor and construction of 132/33 kV substation at Badahari, Sukhipur Municipality – 6. The proposed line will originate from Lahan substation and will be connected to the proposed Sukhipur substation. This substation will feed power to Siraha, Bishnupur and Bhagwanpur substations.

As of July 2021, land acquisition for the substation and feasibility study work has been completed. IEE study of the project is in under progress. ToR of IEE has been submitted to DOED for approval. Preparation of bidding document for construction of boundary wall, guard cum store building is in progress.

## 14. Rupani – Bode Barsain 132 kV Transmission Line

This project is focused on the development of transmission line to cater loads of 33/11 kV substations and improve voltage in Saptari district as well as focused to develop the power transmission line link to Bode Barsain substation, south east region of Saptari district.

Scope of the project includes construction of about 18 km long; double circuit 132 kV transmission line with Bear conductor and construction of 132/33 kV substation at Bodebarsain Municipality – 3. The proposed line will originate from Rupani substation and will be connected to the proposed Bode Barsain substation. This substation will feed power to Bode Barsain, Rajbiraj and Bisanpur substations.

As of July 2021, land acquisition for the substation and the feasibility study work has been completed and IEE study of the project is going on. ToR of IEE has been submitted to DOED for approval. Preparation of bidding document for construction of boundary wall, guard cum store building is in progress.

### 15. Chandrapur - Sukhdevchauk 132 kV Transmission Line

This project is focused on the development of transmission line to cater loads of 33/11 kV substations, reduce frequent tripping & outages and improve voltage in middle and southern parts of Rautahat district. This project is also focused to develop the power transmission line link to Saruatha substation at Ward No.4 of Yamunamai Rural Municipality in southern region of Rautahat.

Scope of the project includes construction of 35 km long; double circuit 132 kV transmission line with Bear conductor and construction of 132/33/11 kV substation at Saruatha of Yamunamai Rural Municipality Ward No.4. The proposed transmission line will originate from exiting NEA Chandrapur substation and will be connected to the Saruatha Substation. The Saruatha substation will feed Gaur, Manpur & Maulapur 33/11 kV substations and proposed SEZ at Jhunkhunma in Yamunamai Rural Municipality.

As of July 2021, the detail feasibility study works has been completed and environment (IEE) study of the project is going on. The land acquisition works for the substation at Saruatha of Yamunamai Rural Municipality Ward No.4 is in final stage.

### 16. Jhurjhure 132 kV Transmission Line

Objective of this project is to reinforce the power supply system of East Makawanpur, West Sindhuli and South Lalitpur areas. Also, it will facilitate power evacuation from IPPs of that area. The 132 kV transmission line will originate from existing Kamane Substation, Hetauda and after traversing around 40 km towards east, it will be connected to the proposed Jhurjhure, Makawanpur Substation. The project is funded by GoN.

Scope of the project include construction of about 40 km long, double circuit 132 kV transmission line with Bear conductor and construction of 132/33/11 kV substation at Jhurjhure.

As of July, detail feasibility study of the project being carried out by NEA Engineering Company Ltd. is in final stage of completion.

### 17. Kathmandu Valley Transmission System Upgradation

Objective of this project is to upgrade the existing power supply system of Kathmandu and Bhaktapur districts through construction of new substation at Thapathali of Kathmandu and Sirutar of Bhaktapur districts.

Scope of the project includes construction of about 1km underground cable from existing Teku substation to Thapathali substation and new 132/11 kV GIS substation at Thapathali and also about 3 km underground cable from existing Bhaktapur substation to Katunje and new 132 /11 kV GIS substation at Sirutar.

As of July 2021, Study works is under progress.

### 18. Surkhet substation

Objective of this project is to improve the power supply system of Surkhet areas.

Scope of the project includes construction of 2x60 MVA 132/33 kV substation at Surkhet. As of July 2021, Land acquisition for the substation is completed. Tender for substation construction will be floated soon.

### 19. Syaule Sanfegagar 132 kV Transmission Line

Objective of this project is to reinforce the power supply system of Achham, Bajura districts of Surdurpashchim Province. It will also evacuate power from Budiganga Hydropower Project (20MW) which is currently under construction by Government of Nepal.

Scope of the project includes construction of about 40 km 132 kV double circuit transmission line from existing Syaule substation to proposed Sanfegagar 132/33/11 kV Sanfegagar substation.

The feasibility works of this project will be initiated soon.

## II. MAJOR 220 KV TRANSMISSION LINE DEPARTMENT

### PROJECTS UNDER CONSTRUCTION

#### 1. Chilime-Trishuli 220 kV Transmission Line

The objective of this project is to evacuate power generated from hydropower projects in Upper Trishuli Valley being constructed by Chilime Hydropower Company Limited notably Upper Sanjen, Sanjen and Rasuwagadhi and other Independent Power Producers (IPPs). The project is funded by German Development Cooperation through (KfW), European Investment Bank (EIB), European Union and GoN.

Contract was signed with M/s PINGGAO GROUP CO., LTD (China) on November 13, 2017 and the contract became effective from December 20, 2017 for the construction of both the substation and transmission line. Contract price for construction of 72 km Circuit length of 220 kV

transmission line with total of 79 nos. of towers is US\$ 6,884,897.67 + NPR 722,555,332.49 and Contract price for construction of 320MVA capacity 220/132/33 kV Chilime Hub New GIS Substation is US\$ 6,412,900.86 + NRS 547,472,116.35. The Power Grid Corporation of India has been awarded the consultancy service contract for the project supervision on 6th July 2016.

The scope of the project includes construction of 28 km long 220 kV transmission line from Chilime Hub to Trishuli Hub substation and construction of 2x160 MVA 220/132 kV plus 1x50 MVA 132/33 kV substation at Thambuchet, Rasuwa. The line has two sections, one section (Chilime Hub substation to Mailung) is 20 km line of double circuit twin Bison ACSR conductor and the other section (Mailung to Trishuli 3B Hub) is 8 km line of four circuit twin Bison ACSR conductor. The 220/132 kV transformer includes two Banks of 160 MVA Auto transformers formed with 7 numbers of 220/132 kV, 53.33MVA Single phase auto transformers and 132/33 kV transformer includes 50 MVA, 132/33 kV, 3 Phase Power Transformer.

The project has achieved overall physical progress of about 74%. The progress on design/drawing approval, site leveling, river protection (15m section out of 50m), 7 (seven) numbers of foundation works with fire walls for, 53.33MVA, single phase auto transformers, major foundations of gantry structures are almost completed. Construction works like quarter buildings, boundary walls, foundation for equipment like CB, CVT, and Isolator etc., control room building, Transit Camp are under progress. Major supplies like 245 kV GIS equipment and communication equipment have been dispatched and reached to the site. Power transformers and have been dispatched and will reach the site very soon. Other equipment like CB, Instrument Transformers etc. are under dispatch stages.

As of July 2021, regard to the transmission line construction of 25 out of 79 complete tower foundation and 12 nos. of legs foundation have been completed. Type test of insulators, GSW earth wire, testing of DB, DD, MB, MD tower type have been completed and type test of OPGW, Hardware is under the process. Major supplies like partial stubs, tower parts and conductors have been dispatched and reached to the site.

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

The major challenges to the project are the terrain, accessibility of road, protection works. Due to COVID-19 Pandemic, project is impacted and is re-scheduled to be completed by December, 2021.

Chilime Hub substation site, ongoing various construction activities (Brick works of FFPH, CRB, cascade protection works).

Chilime-Trishuli 220 kV TLP. Ongoing Layout works, Excavation works, Foundation & Backfilling works with pictures of TL's Terrain.

## 2. Trishuli 3B 220 kV HUB Substation

There are numerous projects currently being constructed and in advanced phase of construction in the Trishuli basin, namely: Upper Trishuli 3A, Upper Trishuli-1, Upper Trishuli 3B, Sanjen, Rasuwagadhi and other IPPs. The objective of this Trishuli 3B 220 kV Hub substation is to accumulate about 600 MW of power and evacuate those power via Trishuli-Matatirtha transmission line to INPS.

The scope of the project includes construction of 2x160 MVA, 220/132 kV plus 1x50 MVA, 132/33 kV substation at Pairebesi, Kispang Rural Municipality of Nuwakot district. The 220/132 kV transformer includes two Banks of 160 MVA Auto transformers (6 numbers of 220/132 kV, 53.33MVA Single phase auto transformers plus 1 number spare) and 132/33 kV transformer includes 50 MVA, 132/33 kV, 3 Phase Power Transformer. 220 kV switchyard bays shall comprise of Hybrid GIS.

The project cost is estimated to be US\$ 17.29 Million with the joint funding of Government of Nepal, KfW Development Bank (German Bank) and European 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 became effective from December 20, 2017.

Since this is a very urgent project to evacuate the power from various IPPs in the Chilime-Trishuli corridor, the project is given a high priority. As of July 2021, the project has achieved overall physical progress of about 87%. The progress on design/drawing approval is about 97%, site leveling (95%) and rivulet protection (96%). Preliminary works like quarter building and boundary walls were completed in 2018.



**Foundation Work with Fire Walls under construction**

67 out of 72 foundations of gantry structures have been completed and foundations for equipment like CB, CT, CVT, BPI, LA and Isolator etc. are under progress.

4 out of 9 Switchyard Panel Rooms have been completed and Transit camp/ Fire-fighting pump house are under progress. Major works around 80% of the river protections (RCC shear wall) near the Trishuli river bank have been completed.

Major supplies like power transformers, communication equipment, CB have been dispatched and will reach to the site very soon. Other equipment like Isolator, Instrument Transformer, LA, BPI etc. are under dispatching stage.

Various studies like feasibility study, SEP, IEE, ESIA & LACP were completed in different phases of the project and technical, social & environmental monitoring & implementation is under progress with support of ESSD, NEA and the Consultant POWERGRID, India. Impact of the COVID-19 Pandemic, non-performance of the contractor and design reviews/approval are few of the major reasons for the delays of the project. Project completion period has been re-scheduled to January 2022.

### 3. Koshi Corridor 220 kV Transmission Line

There is a massive potential for hydropower generation in Taplejung, Panchthar, Sankhuwasabha, Bhojpur, and Terhathum districts Province 1, Nepal. In these districts, from within the Arun and Tamor river basin several hydropower projects have been identified, and some of those are under various stages of construction. The power generated from these hydropower plants require some a robust transmission line for evacuation and connection to the INPS. The objective of Koshi Corridor 220kV Transmission Line Project is the fulfilment of this requirement and to make the transmission and

distribution network of NEA more resilient in this region.

This project is jointly financed by the Government of Nepal, and the Government of India supported Line of Credit from EXIM Bank of India. USD 90 million has been earmarked for this project of out the USD 250 million Line of Credit to the GoN.

The scope of Koshi Corridor 220kV Transmission Line Project covers, inter alia, the following:

- **Under Package KC1:** Through a contract with M/s Kalpataru Power Transmission Ltd., Design, Supply & Construction of ~30km long 220kV Twin ACSR Moose D/C Transmission Line from Tumlingtar Substation to Basantapur SS via Baneshwar SS, and ~76km long Quad ACSR Moose D/C TL from Basantapur SS to Inaruwa SS.
- **Under Package KC2:** Through a contract with M/s Larsen and Toubro Ltd., Design, Supply, & Construction of 220kV Air Insulated Substation at Tumlingtar (2x100 MVA, 220/132 kV; 2x 25/30MVA, 132/33 kV), Baneshwar (2x 25/30MVA, 220/33 kV), and Basantapur (2x 100MVA, 220/132 kV; 1x 20/30MVA, 132/33 kV) and Bay Extension (2x 220kV Bays) works at the Inaruwa substation.
- **Under Package KC3:** Through a contract with KEC International Ltd., Design, Supply, & Construction of 35km long 220kV Twin ACSR Moose D/C TL from Dhungesanghu SS to Basantapur SS and of a 132/33 kV AIS (2x 15MVA). This transmission line will only be charged at 132kV level in the present scope of the project.
- Consultancy service is being provided by M/s WAPCOS India Ltd.

In the present scope of the project, stringing of only single circuit will be carried out. With this infrastructure the transmission line will be capable of evacuating ~1,000MW of power. After the scope of the project is expanded to include stringing of second circuit, Koshi Corridor 220kV TLP will be capable of realizing its full potential of evacuating as much as 2,000MW of power.

#### The Road So Far:

Despite the challenges in land acquisition, securing Right-of-Way, and forest land, formation of access roads and the social problems that form the part and parcel of development of any transmission line, Koshi Corridor 220kV TLP has successfully completed all foundations, all

erections, and all of stringing associated with package KC1. Only final checking, testing, and commissioning remains. In the same vein, 75% of KC-3's transmission line's work has been completed so far.



*Plain region of Koshi Corridor Transmission Line (KC-1)*

Coming to substations, the Tumlingtar, and Baneshwar substations are almost ready and is in the final stages of testing before commissioning. Dhungesaghu and Basantapur Substations are a little behind but construction work is going on strongly despite the inclement climate of continuous rain and fog, despite the pandemic induced disruption in supply chain, and access road that is hard to travel and maintain.



*Baneshwar substation (KC-2)*

## Challenges

**The Pandemic:** The novel coronavirus pandemic is the most prominent culprit in this category. The pandemic has disrupted the supply chain affecting the influx of the variety of skilled human resources and materials. Sealed borders, hesitant labours, and disturbed manufacturing and supply system has severely impacted the progression of the project.

**Climate:** The various sites of this project are spread out across Sankhuwasabha, Taplejung, Terhathum, Dhankuta and Sunsari districts presenting a wide range of elevation and climatic conditions from as little as ~100m above msl to ~3,000m above msl. From the tropical heat to freezing cold. Where workers are hard to retain and very few hours per day are conducive to physically taxing jobs. In the high elevation areas, long durations of rain, fog, snow and hail slow down workers and machinery.

**Access:** Access to some tower locations, and especially the Dhungesanghu substation site is only available for a few dry months a year. During the rest of the year said route can only be traversed by very specific vehicles and by heavy equipment—that too with great difficulty. This obvious effect in supply has large consequences in the whole of substation works.

**Miscellaneous:** Transmission line works, in all areas are riddled with social issues, bureaucratic quagmires in acquisition of land, securing right-of-way, and forest land.

## Target

**KC1:** The completion of all facilities of KC1 is expected by September, 2021.

**KC2:** The completion of all facilities at Tumlingtar SS, Baneshwar SS, and Inaruwa Bay Extension works is expected by September, 2021. Basantapur substation, given its challenging climate and topography is expected to be completed by October, 2021.

**KC3:** The completion of all facilities under KC-3 is expected by December, 2021.

## 4. Lekhnath-Damauli 220 kV Transmission Line

The 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 (600 MVA) and New Damauli (64 MVA). The cost of this project is estimated at US\$ 65 Million. The project is funded by the GoN and Germany (KfW). The project is expected to be completed in F/Y 2080/81.

As of July 2021, detailed survey, feasibility study, Initial Environmental Examination (IEE), baseline Survey for Avian species, procurement of the Project Implementation Consultant (PIC), and the Environment and Social (E&S) Consultant have been completed. Land acquisition for the New Damauli Substation and its access road have been completed. Crop compensation for the affected landowners has been distributed during the Land acquisition for the Damauli substation. Environment and Social (E&S) Consultant, ERM, is preparing the Rapid Assessment & Risk Screening of new Damauli Substation, Habitat Assessment and Biodiversity Action Plan (BAP), Environmental & Social Management System, Resettlement Action Plan (RAP), Grievance Redress Mechanism (GRM). Project Implementation Consultant FICHTNER, Germany, is currently preparing the detailed design and Bid Document of the project for the tendering process. The tender of Access Road and Bridge at New Damauli Substation has been floated.



*Geotechnical Investigation Works (Test Pit) of Chabdi Khola for Bridge construction at New Damauli Substation.*

## PROJECTS UNDER PLANNED AND PROPOSED

### 1. Tumlingtar-Shitalpati 220 kV Transmission Line

#### Background

Considering the immense potential for hydropower generation in the eastern districts of Nepal from the Arun River and its tributaries, an “Arun Hub” is being proposed. This Arun Hub at Shitalpati, Sankhuwasabha also called Shitalpati Substation will be the heart of power generated from Arun basin. Joining from up north, will be the 400kV Quad Moose D/C TL from Kimathanka Arun SS; from west is the Arun-Dudhkoshi 400kV TL; from the east is the 220kV

Twin Moose TL joining in from Tumlingtar Substation of Koshi Corridor 220kV TLP. Ultimately, another 400kV Quad Moose line connects this Arun Hub to Inaruwa Substation. Within this grand scheme to strengthen the INPS backbone in eastern Nepal, the Tumlingtar Shitalpati 220kV TLP constitutes the 220kV Twin Moose ACSR line from Tumlingtar to Shitalpati and the construction of the 220/132/33kV components of the Shitalpati Substation.

#### Objective

Tumlingtar-Shitalpati 220kV Transmission Line Project has been proposed to extend the reach of the INPS at 220kV level from the existing Tumlingtar SS to the proposed Shitalpati SS which can later on function as a hub for power generated from the Arun River basin. Additionally, the Shitalpati SS will also pool the power of local IPPs, transmit it to Tumlingtar SS which can readily evacuate that power using the transmission infrastructure laid down under Koshi Corridor 220kV TLP.

#### Funding

This project's estimated cost of 30MUSD will be funded by the Government of Nepal.

#### Scope

The scope of Tumlingtar-Shitalpati 220kV Transmission Line Project covers the following:

- Construction of 220kV/132kV/33kV level components at the Shitalpati Substation,
- Construction of 2 line-bay extensions at the existing Tumlingtar Substation, and
- Construction of ~15km long 220kV Twin Moose ACSR D/C Transmission Line from Tumlingtar SS to Shitalpati SS

#### The Road So Far

While still in the early stages, land acquisition for the Shitalpati substation has been completed. Detail survey of the transmission line as well as tower spotting has also been completed along with the completion of the topographical survey at Shitalpati. Similarly, construction of boundary wall and staff quarter at the proposed Shitalpati substation is on-going. IEE of the transmission line and substation is also going on.

## Target

Bid for the construction of transmission line and substation works is expected to be floated in the FY 2078/79. In the same FY approval of IEE by concerned authority is also expected.

## 2. Trishuli 3B - Ratmate 220kV Transmission Line

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 2021, the IEE study of the project is going on and the bid preparation for above works is under progress.

**Estimated Cost: NRS 2213 million**

**Expected Completion Date: FY 2080/81**

## 3. Dhaubadi Iron Mines Electricity Transmission Line

The objective of this project is to provide the power supply for the proposed Dhaubadi Iron Industry in Nawalparasi (East) district which is under Dhaubadi Iron Company Limited. After completing the project, apart from providing the reliable power supply to first iron industry in the country, the power supply system in Kawasoti, Devchuli, Gaidakot and Mandhyabindu Municipality in Nawalparasi (East) district shall be improved by interconnection of Kawasoti 132kV existing substation. The source of fund for executing the project is managed from government of Nepal and the project is expected to enter in to the construction stage in FY 2079/80.

The project comprises of about 10 km long 220kV four circuit transmission line with twin moose ASCR conductor and about 5 km 132kV double circuit transmission line. The transmission line shall originate from Kawasoti, in the section of Bharatpur-Bardaghat 220kV line and connects the proposed Dhaubadi 220 kV Substation.

As of July 2021, initial Grid Impact Study (GIS) has been completed and the feasibility study is ongoing.

## 4. Dharan 220/33 kV Substation

Dharan and adjoining area offers a huge potential for industrial and commercial sector to grow. The present 33 kV supply system from Duhabi is insufficient to cater the demand and therefore, to provide adequate, reliable and uninterrupted power supply in these areas, it is essential to build high voltage substation at Dharan.

The scope of this project includes construction of 220/33 kV, 63 MVA and 33/11 kV, 10 MVA substation at Dharan with Loop In Loop Out (LILO) of one circuit of Koshi Corridor 220kV transmission line. The land has been acquired for construction of proposed substation in this fiscal year. Additionally, topographical survey of the acquired land has also been completed. Initial Environmental Examination (IEE) and Geotechnical investigation of substation land has also been initiated in this FY 2077/78. The bid for the construction of substation is expected to be floated in this fiscal year subject to approval of IEE by the relevant authority. The estimated cost of the project is 15 MUSD and is funded by GoN.

## III. MAJOR 400 KV TRANSMISSION LINE PROJECT

### PROJECTS UNDER CONSTRUCTION

#### 1. Hetauda- Dhalkebar-Inaruwa 400 kV Substation Expansion

Hetauda-Dhalkebar-Inaruwa 400kV Substation Expansion Project is funded by the Government of Nepal which includes Nepal's first three major grid substations of 400kV voltage level at Hetauda, Dhalkebar and Inaruwa. The Dhalkebar 400kV substation is connected to the Muzaffarpur (India) substation via. Dhalkebar-Muzaffarpur 400kV cross border transmission line that will also be connected to Hetauda and Inaruwa via. Hetauda-Dhalkebar-Inaruwa 400kV Transmission Line. The Dhalkebar- Muzaffarpur cross-border link became instrumental for exporting/importing the electricity between Nepal and India. All three substations aim to serve as a backbone to transmission line system in the national grid of Nepal. This project was started in the fiscal year 2073/74.

The scope of project includes the construction of 400 kV six line bays for termination of 400 kV double circuit lines from Muzaffarpur (India), Hetauda and Inaruwa, 400/220 kV, 3x315MVA 3 phase transformers, 80MVAR 3 phase bus reactor and its associated bays at Dhalkebar substation,

400 kV four line bays for termination of 400 kV double circuit lines from Dhalkebar and Ratmate, 400/220 kV, 4X167 MVA 1 phase transformers, 50 MVar 3 phase bus reactor and its associated bays at Hetauda substation and two line bays for termination of 400 kV double circuit lines from Dhalkebar, 400/220 kV, 3x315MVA 3 phase transformers, 50MVar 3 phase bus reactor and its associated bays at Inaruwa substation.

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. 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 had been awarded to ABB India Limited on December 2017 (latter on assignment of the project had been transfer to Linxon India Pvt. Limited on July 2020). The cost of project is US\$17.58 million and NPR 220.33 million. Despite covid -19 pandemic and lockdown imposed by GoN the construction of the Dhalkebar substation has been completed and in operation since November 11, 2020. Honorable Prime Minister of Nepal KP Sharma Oli inaugurate the substation on February 1, 2021 (BS 2077-10-19).



**400 kV Transformer at Dhalkebar**

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 expected to be completed on December 31, 2021. The estimated project cost is US\$ 28.41 million and NPR 410.54 million. As a consequences of COVID-19 pandemic and lockdown imposed by Government of Nepal, the works schedule of the substations has been affected. As of July 2021, the majority of engineering & design works has been completed. Majority of equipments including 400 kV GIS, 400/220 kV outdoor equipments, reactors, transformers, CRP & SAS Equipments, PEB Building Materials etc. are already reached at both site while several items including Battery & charger, Communication equipment, firefighting material, earthing materials have been dispatched from respective factories. GIS Hall foundation works is completed and is ready of installation of PEB superstructure at both sites. Civil foundation works for transformers, reactors, towers, equipments structures and Structural part of the buildings works are completed at both sites. The installations of tower & equipment structures, finishing works of the CRB, Cable trenches etc. work is in progress. Installations works will be stated immediately after received of equipments at sites.



**Under construction 400 kV GIS Hall at Hetauda**

## 2. Bheri Corridor 400 kV Transmission Line

This project is 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. 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. The project is started in 2072/073 and expected to be completed in 2080/081.

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. The scope also includes the construction of one 400/132 kV, 200 MVA Uttarganga substation hub at Bafikot, Rukum (West).

As of July 2021, the land acquisition for the Uttarganga substation hub at Bafikot, Rukum (West) has been completed after long detainment of around 3 years due to numerous reasons. Tendering for Civil works at substation land has been completed recently. Detail field survey of Substation areas, line route, Initial environmental examination (IEE) works along with preparation of office estimate works is aimed to be started simultaneously by FY 2078/079.

### 3. Ratmate-Rasuwegadhi-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 of China. This will open new avenues in terms of electricity market in Nepal as the rising demand of electricity shall be fulfilled by importing from China and to export surplus energy after a few years in near future. So, the power interconnection is one of the major components to carry out the development projects between Nepal and China for connectivity. The project was initiated in the year 2017. The project cost is estimated to be around US\$ 96.79 Million.

Scope of the project consists of design, supply and construction of approximately 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, via proposed Trishuli Substation. Furthermore, DC converter station is to be constructed at Gyirong County, Tibet for the purpose of power exchange between two countries and a 400 kV substation is to be constructed at Ratmate, Nepal for evacuation of the power to load centers.

As of July 2021, the detail survey works for this project is being carried out and final report Phase-I (Transmission line) and draft report Phase-II (Substation) have been prepared. The route alignment of the transmission line has been optimized as per the GIS routing tools of spatial sciences. Similarly, Environmental Impact Assessment (EIA) study is being carried out by NEA Engineering

Company Ltd, after obtaining the relevant permissions from Department of National Parks and Wildlife Conservation, Government of Nepal, as the northern portion of the proposed route alignment passes through Lamtang National Park. Survey and demarcation works at proposed Trishuli Substation area have been completed so far and detail design works are being carried out.

Furthermore, Load flow analysis of the Nepali side of the Ratmate-Rasuwegadhi-Kerung 400 kV line has been conducted. Forecasted Power capacity and Energy balance report of the Integrated Nepalese Power System has been sent to the State Grid Corporation of China, Beijing and similar report of Tibet Electric Grid has also been received.

## NEPAL-INDIA ELECTRICITY TRANSMISSION AND TRADE PROJECT (NIETTP)

Nepal-India Electricity Transmission and Trade Project (NIETTP) funded by World Bank was started 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 enhance the reliability of electricity supply. Furthermore, under NIETTP additional funding, construction of Hetauda-Bharatpur -Bardaghat 220 kV Transmission Lines and concomitant 132 kV substation at Hetadua, Bharatpur and Bardaghat. In addition, Transmission System Master Plan of Nepal had been prepared under this project and 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.

## 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 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 220kV substations construction works. This project was started on year 2012 and likely to be completed by year 2022. The estimated project cost is around US\$ 170 million and it is funded by World Bank. For this, contract has been awarded to Angelique International Limited, India – LTB Leitungsbau

GmbH, Germany Joint Venture (AIL-LTB JV) on February 3, 2013. The original completion time was 30 months after the contract effective but due to delay in the site clearance by the various issues of Right of Way (ROW) of lines the completion schedule was revised and expected to be completed by the year 2022.

**The scope of the project includes followings:**

- Design, supply and construction of approximately 288 km of Hetauda-Dhalkebar-Inaruwa 400 kV, double circuit Quad Moose ACSR conductor transmission line.
- Design, supply and construction of Hetauda substation: 220/132 kV, 2X160 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.
- Design, supply and construction of Dhalkebar substation: 220/132 kV, 2X160 MVA Transformers and its associated bays, and 220 kV line bays for the termination of 220 kV double circuit lines from Khimti.
- Design, supply and construction of Inaruwa substation: 220/132 kV, 2X160 MVA and 220/33 kV, 2X63 MVA Transformers and its associated bays; 132 kV, 25 MVA Bus Reactor and its associated bay; 2 nos. of 220 kV line bays for the termination of 220 kV double circuit lines from Basantpur (Koshi Corridor transmission line), 6 nos. of 33kV line bays and 4 nos. 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.

As of July 2021, Out of 792 tower pads, 659 foundation have been completed and 633 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 Makwanpur and Bara districts. There is public dispute at some location which is also hindering the progress. Out of eight pile

foundations, two pile foundation work at Koshi river has been completed.

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, 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-Muzzaffar 400kV Transmission Line was charged at 132kV importing 100MW power from India. After successfully charging of 220kV Dhalkebar substation at 220kV voltage level on August 16, 2018, power in the tune of 260 MW power is being imported during peak hours through Dhalkebar-Muzzaffar 400 kV transmission line charged at 220 kV level. Dhalkebar substation is the Nepal's first 220kV AIS substation. The capacity of 220/132kV Dhalkebar substation is 950 MVA.

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. As of now, for Hetauda and Inaruwa substation majority of the substation equipment delivered at site. At Hetauda substation, about 80% of 220kV switchyard equipment and gantry tower erection completed and water tank work is in progress. At Inaruwa substation 220kV equipment, gantry tower erection, about 90% of 132kV equipment and gantry tower erection has been completed. Control building, Switchyard Panel Room (SPR), cable trench, 33kV equipment foundation, transformer foundation and other civil works are in progress. The project is expected to be completed by the year 2021.



***Inaruwa 400 kV Under-construction Substation***



400 kV Tower Erection Works

## 2. Hetauda – Bharatpur – Bardaghat 220kV Transmission Line

Objective of this project is to enhance the transmission capacity and bolster 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. The project was started in 2008 and funded by World Bank.

### 2.1 Bharatpur-Bardaghat 220 kV Transmission Line.

Scope of the project is to construct 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 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 July 2021, out of 246 tower pads, 244 tower foundations, 244 tower erections and stringing of 134 circuit kilometers of conductors have been completed.

100% of the site is cleared and 90% of Project Affected Families (PAFs) are compensated for their structure damage. The line is expected to be completed by December, 2021 as there is significant divergence from proposed schedule expecting to completed by the end of next month because of the stay order issued by the Supreme Court of Nepal against the construction work in Dumkibas (the disputed area) and the nationwide lockdown (and thus complete abandoning of site activities for the period) due to Covid-19.

### 2.2 Hetauda-Bharatpur 220 kV Transmission Line

The scope of this project is to construct 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 but was terminated on 29th April, 2019 due to contractor's non performance. After the termination of contract, new contract for the balanced work was awarded to M/s KEC International Ltd., India on 5th June, 2020 with the contract value of US\$ 5.4 Million plus NPR 368.8 Million.

As of July 2021, Hetauda - Bharatpur line section: out of 226 tower pads, 196 tower foundations have been casted, 121 towers have been erected, a 20 circuit 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 new Contract for balanced work with KEC International Ltd. covers all remaining activities of the project and is expected to be completed within 15 months from the effective date of the Contract.

The scope of this project 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 July 2021, the overall progress of the construction of substation is about 96%. Almost all the equipment have been supplied and the installation works is about to complete.



## PROJECTS UNDER PLANNED AND PROPOSED

### 1. Arun-Inaruwa-Tingla-Mirchaiya 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 in the Eastern part of Nepal 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 ArunDudhkoshi-Tingla400 kV Transmission Line and associated substations. For feasibility study and detail design contract was signed with ELC Electroconsult S.p.A, on 23rd September, 2019. As of July 2021, desk study and walkover survey for all three transmission line has been completed and the power flow study is underway. For the Environmental and Social Studies, contract was signed with WAPCOS Limited, India on 25th July, 2021. Both feasibility study & detail design and environment & social study is expected to be completed by September 2022. After the completion of the study, the construction of transmission line and associated substation will be taken up by arranging the necessary funds.

## IV. SYSTEM OPERATION DEPARTMENT

The Load Dispatch Centre (LDC) centrally located at Siuchatar, Kathmandu under the System Operation Department (SOD), Transmission Directorate is the core center for operation, monitoring, and control of integrated Nepal power system (INPS) to ensure continuous and quality power supply to consumers. The SCADA (Supervisory Control and Data acquisition system) set up in LDC facilitates collecting real time system data of generators and power system elements like transmission lines, power transformers, feeders, etc. of the interconnected system thus contributing considerably for monitoring and supervision of the system for proficient system operation. The major highlights of this fiscal year are presented below.

1	Annual Peak Demand	1481.85 MW	1/13/2078
2	Annual Energy Demand	8960.31 GWh	
3	Annual Load Factor	69%	
4	Total export Energy	32.38 GWh	

5	The maximum Energy demand of the Day	30.53 GWh	1/30/2078
6	The maximum power imported in a Day	846.74 MW	1/14/2078
7	The maximum Energy import of the Day	18.30 GWh	1/15/2078

*\*based on LDC data*

### The key accomplishments of LDC in this Fiscal Year

#### • Participation in IEX DAM

NEA started to purchase power from India by participating in Day Ahead Market through Indian Energy exchange and trading partner NVVN. Nepal is the first country to participate in Indian energy Market. The required quantum can be purchased on day ahead basis, which enables system operator to operate the system efficiently balancing supply and demand. The power trading unit in LDC has a responsibility to bid daily on IEX-DAM. So far 144832.13 MWh of energy has been purchased from IEX in this FY.

#### • Up gradation of system voltage

The up gradation of Dhalkebar- Muzzafarpur 220 kV line to 400 kV on 2077/07/26 with commissioning of Dhalkebar 400/220/132 substations and operation of newly constructed Dana-Kusma 220kV line helped meaningfully to maintain the system voltage at desired level. Furthermore up to 350 MW power from Muzzafarpur India has been imported which helps to cater the growing demand of power in the country especially in dry season. Similarly Dana-Kusma 220kV transmission line made possible to evacuate power generated from some of the IPPs from that reason. The commissioning of New khimti 220/132 kV substation on 2078/03/20 helps immensely to strengthen the grid as 220 kV transmission line from Upper Tamakoshi hydroelectric project is connected to the grid via this substation. The addition of Samundratar 132/33 kV substation and Samundratar- Trisuli 3B transmission line on 24th June 2021 benefits upcoming IPPs from that region as their generation can easily delivered to INPS and growing power demand of the area can also be met.

#### • Frequency and voltage control

Frequency and voltage are the crucial parameters of the power system as it determines the quality of power supply to costumers. In this FY, most of time the system frequency is maintained at 50 Hz. In this FY, the voltage attained in most of the load centers'

substations is in the range of permissible limit of +/- 10% limit at 132 and 66 kV as per NEA Grid Code. However, in mid-western region, occasionally system voltage was recorded low than permissible limit in some substations. However due to installation of capacitor bank in various strategically located substations by Grid Department and the effective monitoring by LDC, voltage is maintained at the desired level.

#### • Dispatching and scheduling

Effective short term forecasting, daily energy scheduling of INPS, and proficient dispatching of IPPs generation have made it possible to optimize available generation and import of power from India. This has enabled LDC to realize the economic dispatch of power keeping voltage and frequency of the system within a standard limit. This fiscal year generation of Kulekhani 1 and Kulekhani 2 storage plant has increased by 21% and 17 % respectively as compared to last year. Despite the Kulekhani water being best exploited in this fiscal year, the tactical planning of Kulekhani water level by LDC aided to maintain the respectable level of reservoir at present also. Similarly, the generation of other NEA ROR and PROR plants has also increased considerably due to the well-organized operation of the system.

#### • Shutdown coordination

On the coordination of LDC, major power plant like Kaligandaki-A, Marsyangdi took shutdown for overhauling of their unit (generator) in this FY. Also major shutdowns of transmission lines were completed. Likewise, different grid divisions also took a scheduled shutdown of major transmission lines for maintenance and emergency shutdown during a breakdown. Similarly, the approved shutdown schedule and emergency shutdown plan of IPPs were implemented successfully. The skillful handling of system by the operator during the shutdown period has made it possible to supply power with minimum interruption.

#### • Partial system tripping

The persistent monitoring of the system and the prompt decision of the operator during abnormal situations has helped significantly to control the partial tripping of the system. In this fiscal year the number of total partial system tripping has dropped down to 40 as compared to 41 last year. This has contributed a positive impact on the financial shape of the NEA.

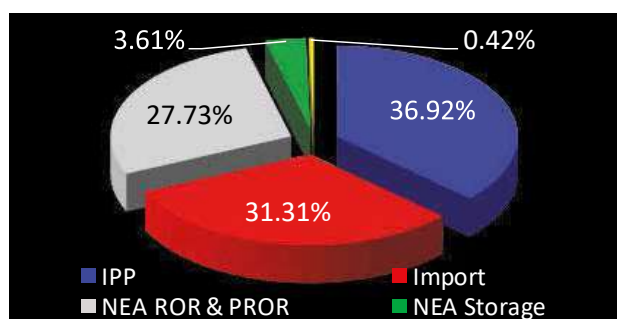
#### • Maintenance of SCADA and communication facilities

For the continued smooth functioning of the INPS, the data acquisition from the power stations and substations must be updated according to the latest changes/modifications in the respective stations. 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 of three primary component of SCADA: RTU, Communication equipment and optical fibers, master stations. A significant amount of revenue is being received annually by leasing (to Nepal Telecom and other private companies) optical fiber cable.

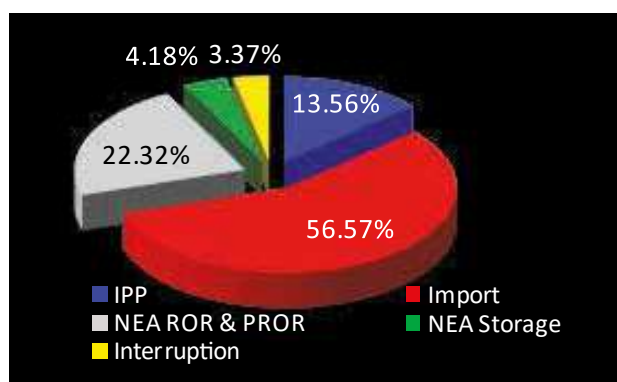
#### • Status of Supply and Demand

In this fiscal year, 221 MW of power is added to the INPS including one unit of Upper Tamakoshi3A (75 MW), Mistri Khola (42 MW) and other IPPs. which facilitated to fulfill the increasing demand of the system and also helped to minimize power import to certain extent. The quantum of imported power has increased by 78.45 % as compared to last year whereas the generation of IPPs and NEA storage plant has been increased by 19.82 % and 35.54 % respectively. The overall energy demand and peak demand increased by 11.7 and 9.11 percent respectively in this FY.

The contribution of different sources to meet the total annual energy demand and Peak demand of the INPS for the fiscal year 2077/78 is given below.



Annual Energy Demand management from contribution of different sources



Peak Demand of the year management from contribution of different sources

### III. Challenges

- Because of an addition of the generation in system, the existing ageing transmission structures are inadequate to transmit power to load centers. Depending on the system scenarios, the transmission line Hetauda-Bharatpur 132 kV, Damauli-Bharatpur 132kV, Bharatpur-Kawasoti-Bardghat 132 kV were being operated almost in full capacity continuously which might have instigated the power cut in some areas.
- In this fiscal year, in the first week of Ashadh, high flood had damaged completely one tower of New Marsyangdi- Middle Marsyangdi transmission line and some towers of Indrawati –Panchkhal 66 kV transmission line. Thus significant quantum of power is unavailable in the system creating difficulty in smooth operation of the system.
- The frequent forced outages of power plants during rainy season and frequent unforced shutdown of transmission line has created difficulty in the smooth operation of the system.

### IV. Future Plan

NEA is planning to synchronize the Indian system with INPS. The objective of this arrangement includes the installation of SPS (special protection scheme), Communication and SCADA system within the Nepalese power system. LDC has been given responsibility to implement the project. For the same, the contractor had been already selected for the execution of works to install the SPS system at existing Dhalkebar, Chandranigahapur, Kamane, Bharatpur, Butwal, Hetauda, Bhaktapur and Lamahi substations. The strengthening of the protection system and the communication system of present INPS are also on the contractor's scope of the work. Synchronization of two grids will increase the reliability and security of the INPS system as well as creates an opportunity for power exchange between two countries through market transactions.

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

### V. GRID OPERATION DEPARTMENT

Grid Operation Department (GOD) is one of the department under Transmission Directorate which is responsible for transmitting reliable and quality power

from remote generating stations to various load centers. This department has to manage the operation of 66 kV & higher voltage substations and transmission lines upto 400 kV. This department also carry out preventive and breakdown maintenance works of the substation and associated transmission lines. The extension, replacement works, reactive compensation, rehabilitation and reinforcement works etc of substations are also performed by this department. It also looks after connection facilities to IPPs and Bulk Consumers at different voltage levels by performing Connection Agreement as per NEA Grid Code. The operation and maintenance of Nepal portion of 400kV Dhalkebar - Muzaffarpur transmission line which was charged at 400 kV Voltage level on 2077/07/26 and owned by Power Transmission Company of Nepal (PTCN) is also done by this department. It supervises three division offices in Kathmandu, Hetauda, Butwal and four branch offices in Duhabi, Pokhara, Attaria & Dhalkebar.

#### Kathmandu Grid Division

Kathmandu Grid Division is located at Meenbawan, Baneshwor of Kathmandu district in Bagmati Province. There are 15 Substations located in and around the Kathmandu Valley namely Balaju, Banepa, Baneshwor, Bhaktapur, Chapali, K3, Lainchaur, Lamosanghu, Matatirtha, New Chabahil, New Patan, Panchkhal, Siuchatar and Teku which comes under supervision of this division. The division is also responsible for routine & breakdown maintenance of 66 kV and higher voltage transmission lines inside the Kathmandu Valley and those which are connected to the Kathmandu mainly from Chilime, Devighat, Khimti, Marsyangdi, Trishuli and Trishuli 3B.



*Maintenance of Khimti 132 kV Substation*

### Hetauda Grid Division

Hetauda Grid Division is located at Chowkitole, Hetauda of Makwanpur district in Bagmati Province. The major responsibility of this division is to look after the operation and maintenance of 66kV & higher voltage substations and transmission lines located in the Central part (except those Transmission Lines and Substations under Kathmandu Grid Division) of the country. Nine Substations at Amlekhgunj, Bharatpur, Birgunj, Hetauda, Kamane, New Parwanipur, Pathlaiya, Purbi Chitwan and Simara are supervised by the division. This division also looks after transmission Lines and substations in Bara, Chitwan, Makwanpur, Parsa and some portion of Tanahun Districts. 132kV double circuit transmission lines under this division includes the line from Bakaiya River of Bara District - Pathlaiya - Kamane - Hetauda Sections. Similarly 132kV 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. 66kV double circuit transmission lines under this division includes the line from Markhu dam - Kulekhani 1 - Hetauda - New Parwanipur - Birgunj sections.



**Tower Foundation Protection works**

### Butwal Grid Division

Butwal Grid Division is located at Yogikuti of Rupandehi district in Lumbini Province. This division looks after the operation and maintenance of six Substations namely Bardghat, Butwal, Chanauta, Ghorahi, Kawasoti and Lamahi. 132 kV transmission lines that includes 132 kV single circuit Bharatpur - Kawasoti - Bardghat and Bardghat - Gandak sections, double circuit Lamahi – Ghorahi, Kaligandaki - Butwal and Bardghat - Butwal - Chanauta - Lamahi - Emiliya (Dang) sections are supervised by this

division.



**Conductor Maintenance of KG 1 & 2 Circuit**

### Attaria Grid Branch

Attaria Grid Branch is located at Attaria chowk, Dhangadhi Road, Godawari Municipality of Kailali district in Far Western Province. This branch has nine Substations namely Attaria, Bhurigaun, Hapure, Kohalpur, Kusum, Lalpur (Mahendranagar), Lamki, Pahalmanpur and Syaule. The operating area of this branch includes Baitadi, Banke, Bardia, Dadeldhura, Dang, Darchula, Doti, Kailali and Kanchanpur districts. The 132kV 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 office is located in Pokhara Metropolitan city Ward No 27 of Kaski district in Gandaki

Province. The major responsibility of this branch is to look after the operation and maintenance of 132 kV, 220kV substations and different 132 kV & 220 kV transmission lines located in the Gandaki Province of the country. The working area of this branch includes Chitwan, Kaski, Lamjung, Parbat, Syangja and Tanahun, Myagdi & Parwat districts. This branch supervises and manages 7 substations namely Damauli, Lekhnath, Markichowk, Pokhara, Syangja, Dana And Kushma. This branch includes 132 kV transmission lines from Modi Khola - Pokhara - Lekhnath - Damauli - Bharatpur section, Kaligandaki - Lekhnath section in Single Circuit, Middle Marsyangdi - Markichowk - Marsyangdi section and Double Circuit 220 kV Double line from Dana to Kushma Section.



**15 MVA , 132/33 kV Power Transformer Replacement Work at Damauli Substation**

### Dhalkebar Grid Branch

Dhalkebar Grid Branch is located at Dhalkebar, Mithila Municipality of Dhanusha district in Province No. 2. This branch supervises and manages 5 substations namely Chandranigahpur, Dhalkebar, Lahan, Mirchaiya and Rupani. This branch carry out maintenance works of the transmission lines in Saptari, Siraha, Dhanusa, Sindhuli, Ramechhap, Mohattari, Sarlahi, Rautahat and Bara districts. The transmission lines in this branch includes 132 kV double circuit transmission lines from Mahauli of Saptari district to Nijgadh of Bara district, 220 kV double circuit transmission line with twin Bison conductor from Dhalkebar to Khimti Power House substation at Kirne of Ramechhap district one circuit currently charged at 132 kV voltage level and another circuit at 220kV. This branch also looks after Dhalkebar- Muzzafarpur 400 kV double circuit transmission with twin moose conductor from Sursand of India to Dhalkebar substation.

### Duhabi Grid Branch

Duhabi Grid Branch is located at Duhabi, Inaruwa Road, Duhabi Municipality of Sunsari district in Province No 1. This branch supervises and manages 7 substations

namely Amarapur (Kabeli), Phidim (Thapatar), Godak, Damak (Parajungi), Anarmani, Duhabi and Kushaha. The working areas of this branch include Panchthar, Illam, Jhapa, Morang, Sunsari and Saptari districts. This branch includes 132 kV transmission lines from Mahauli Khola of Saptari district to 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).



**Tower protection work, duhabi-anarmani section 132 kV transmission line tower no. 37 (Lohandra Khola)**

### A. Major reinforcement/upgradation works performed

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

Various works executed by this department have supported to reduce power interruption due to inadequate substation capacity. The department has carried out and completed various up-gradation and reinforcement works in FY 2077/78 (2020/21) which are attached in Annexure B.

### B. Major reinforcement/upgradation works in progress

The major up-gradation & reinforcement works for various substations have been initiated and these works are under progress as attached in Annexure B.

### C. Grid Connection Agreement

The Department has successfully accomplished the Grid Connection Agreement with 25 IPPs (Independent Power Producers) for 701.67MW capacity to meet future load demand.

### D. Major Maintenance works

The following major maintenance works have been completed in FY 2077/78.

- Relocation of damaged Tower No. 205 of Siuchatar - Marshyangdi 132kV Transmission Line at Kurintar. The Tower was damaged due to landslide.
- Rearranging of phase sequence at Khimti Substation for synchronizing Dhalkebar 132kV and Lamosanghu 132kV Transmission Line.

- Repair of damaged Tower No. 183 of Siuchatar - Marshyangdi 132kV Transmission Line. The Tower got damaged as it was struck by large stone due to landslide.
- Synchronization of Raxual Line with INPS after phase sequence re-arrangement at Parwanipur Substation.
- Erection of ERS Tower for Tower no. 9 of Middle Marshyangdi to Marshyangdi 132kV Line. The Tower was totally damaged due to Landslide.
- Total of 105 relays were tested at various substations.
- Total of 69 energy meters 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%
7	2076/77	7,149,391.47	6,826,833.47	322,558.00	4.51%
8	2077/78	8,170,175.54	7,791,266.08	378,909.47	4.64%

The single line diagram (SLD) of the existing high voltage substations are presented in Annexure C.

## 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 necessary for immediate replacement. The project was started in F/Y 2073/074 with the estimated cost of US\$ 8.4 Million by GoN funding.

The main scope of the project includes replacement of 132 kV, 66 kV & 33 kV old circuit breakers with new one, installation of 33/11 kV, 16.6 MVA 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.

Under this project total 18 nos. of 132 kV, 2 nos. of 66 kV

and 11 nos. of 33 kV circuit breakers were procured 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 has been upgraded to 16.6 MVA on April 2019. The installation of this new transformer 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 procured, out of which, 1 no. of 132/33 kV, 63 MVA power transformer was installed at Kohalpur substation, 2 nos. of 132/11 kV, 30MVA were installed at Bharatpur substation and 1 no. of 33/11 kV, 16.6 MVA power transformer was installed at Anarmani substation and another 33/11 kV, 16.6MVA was installed at Dhakdahi substation. 1 no. of 132/33 kV, 63 MVA power transformer

was installed at Kamane substation with the construction of New Transformer Bay..

Similarly, the new 132/11 kV, 22.5 MVA transformer bay has been commissioned at Bhaktapur substation increasing the overall capacity of the substation from 45 MVA to 67.5 MVA.

Two nos. of 220/132 kV, 315 MVA auto transformer has been commissioned at Dhalkebar substation. This has helped in bulk power import / export to India.

### Emergency Restoration Systems (ERS) use in NEA

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.

### Successful Use of ERS at Middle Marsyandi- Marsyandi 132 kV Transmission line, Lamjung

Due to Landslide on 3 July, 2021 (2078-03-19), TN-09 of Middle Marsyandi- Marsyandi 132 kV Transmission line located at Rainas Nagarpalika Ward No. 08, Majhigau Lamjung district was completely collapsed interrupting power flow from Middle Marsyandi (70 MW), Upper Marsyandi (50 MW) and other IPPs in Lamjung District. The Director of Grid operation Department, team of Pokhara Grid, Experts & Surveyors from transmission directorate moved to site the next day for inspection of situation and to plan for further works. After transporting ERS components from Piluwa substation, Pathalaiya and performing all design and installation work of ERS, the line was restored on 17 July, 2021 (2078-04-02), in spite of continuous rainfall and difficult geography. This was crucial work for quick rehabilitation of transmission line.

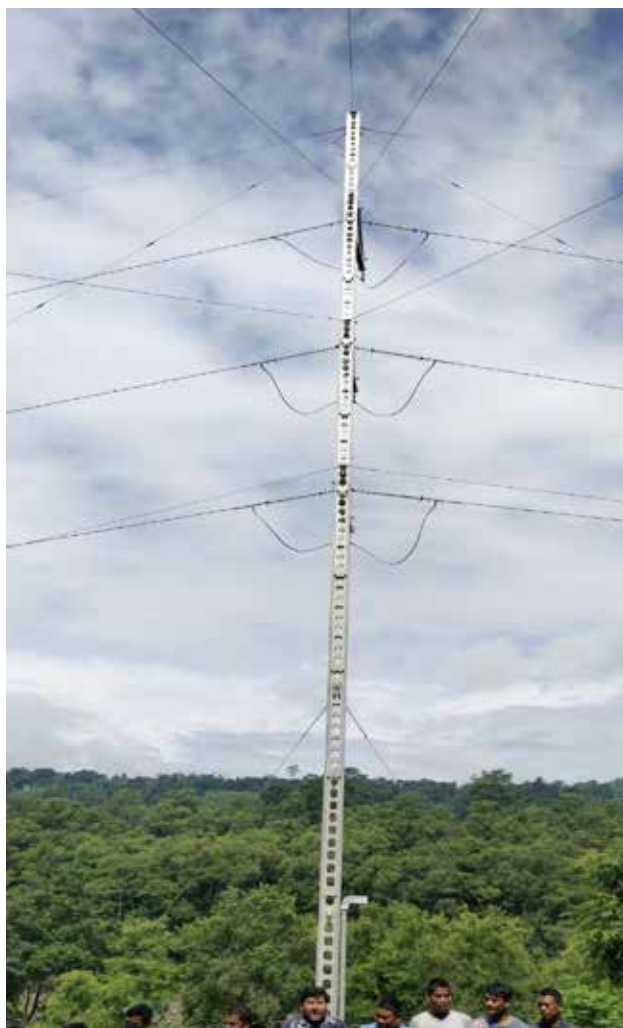
### Some images of Lamjung ERS are



*TN-09 Collapse due to Landslide*



*Transportation and erection of ERS components*



*ERS after Completion*

## 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.

## VI. 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, 636 employee are working out of 793 approved positions. The details of employees working under Directorate and its offices are as presented in annexure of this report.

## VII. 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.

The expenditure in the projects under Transmission Directorate is around 71.7 %, a slight decrease from previous year figure of 95.3 % due Covid-19 impact.

Fiscal Year	Approved Budget in thousand, NRs	Expenditure in thousand, NRs	Percentage 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
2076/77	14,364,995	13,690,313	95.3
2077/78	13,116,353	9,403,828	71.7

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 2077/78 from various sources including surcharge income, sale of tender form and other items, access rental (including OPGW) and other miscellaneous sources is NRs. 43,12,97,936.93 .



# PROJECT MANAGEMENT DIRECTORATE (PMD)

Project Management Directorate (PMD) in the Nepal Electricity Authority's organogram has a role to execute and facilitate projects funded by Asian Development Bank (ADB) and European Investment Bank (EIB). PMD is responsible for project preparation, procurement and implementation of all new and existing projects that is or will be funded by ADB. At present, PMD is executing diverse projects in energy sector including transmission line, substation, distribution system, distribution system modernization, smart meters and automation under ADB financed (i) SASEC – Power System Expansion Project (SPSEP) (ii) Electricity Transmission Expansion and Supply Improvement Project (ETESIP) (iii) Power Transmission and Distribution Efficiency Enhancement Project (PTDEEP) (iv) SASEC Power Transmission and Distribution System Strengthening Projects (SASEC PTDSPP) and (v) Electricity Grid Modernization Project (EGMP). PMD is also leading environmental and engineering study of different transmission lines up to 400 kV voltage level with length of more than 1000 km and substations associated with it under ADB Grant No. 0361: Project Preparatory Facility for Energy (PPFE).

PMD has been involved in preparation, procurement and implementation of both transmission and distribution projects. It is also engaged in introducing modern technology in NEA such as grid substation automation system, smart metering, distribution system undergrounding and distribution system automation. A number of transmission lines and substations of different voltage level ranging from 132 kV to 400 kV are under construction and several 400 kV lines and associated substations are under study. PMD is also playing 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 supply reliability.

PMD has successfully completed 40 km of Dana-Kusma 220 kV Transmission Line and associated substations at Dana (220/132kV, 100 MVA; 132/33 kV, 25 MVA) and Kusma (220/132kV, 100 MVA). Similarly, 26 km of Samundratar-Trishuli 3B 132 kV double circuit line and associated substation (132/33 kV, 60 MVA; 33/11 kV, 16 MVA) has been completed and commissioned. PMD engagement includes the following major works in transmission sector:

1. Engineering and environmental study of 1920 circuit km of 400 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 96 circuit km of 220 kV transmission line, 422 circuit km of 132 kV transmission line (including 10 circuit km of underground transmission line), 4 circuit km of 66 kV underground transmission line and 220/132 kV, 132/66 kV, 132/33 kV, 132/11 kV substation all totaling a capacity of 567 MVA.
3. Construction work of 180 circuit km of 400 kV transmission line, 608 circuit km of 220 kV TL and 28 circuit km of 132 kV transmission line, construction work 1265 MVA of 400/200 kV substation, 1800 MVA of 220/132 kV substation, 410 MVA of 132/33 kV substation, 342.5 MVA of 132/11 kV substation.
4. Completion of construction and upgradation of 357.4 MVA capacity of 132 kV SS.

PMD has been working continuously to adopt modern technology in transmission 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 technology in transmission line stringing, transmission line maintenance and in surveying works.

In fiscal year 2078/79, PMD has targeted to complete following transmission line and substations:

1. 82 km of Marysangdi-Kathmandu 220 kV double circuit transmission line
2. 220/132 kV, 100 MVA New Butwal substation
3. 220/132 kV, 160 MVA Bahrabise Substation

## Project Highlights

### 1) Tamakoshi- Kathmandu 220/400 kV Transmission Line

This is one of the sub-projects undertaken and being executed by PMD under Loan No. 2808 - NEP: Electricity Transmission Expansion and System Improvement Project (ETESIP). This project will play an important role to evacuate power from upcoming generating stations in Khimti (Tamakoshi) and Barhabise area. This project includes three sub-projects viz. (i) New Khimti – Barhabise 400 kV DC Transmission Line of length 44 km (ii) Barhabise-Lapsipedi 400 kV DC Transmission Line of length 46 km & Lapsipedi-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 (PTDEEP).

The contract for construction of New Khimti – Bahrabise 400 kV Transmission Line is signed with M/S KEC International Limited, India. Design/drawings for most of the equipment is already approved. Out of 114 nos. of towers of 400 kV TL, 22 tower foundations have been completed and 2 towers have been erected. This transmission line is expected to be completed by July 2022.

The contract for construction of Barhabise-Kathmandu 400 kV and 132 kV Lapsipedi-Changunarayan 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 90% of TL materials have been supplied. Out of 122 nos. of towers of 400 kV TL, 98 tower foundations have been completed and 78 towers have been erected. The

transmission line has been expected to be complete by July 2022.



**Tower erection works at AP 30/0 for Bahrabise-Kathmandu 400 kV transmission line**

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. Construction work at site is going on. Power and station transformer has been received at site. 220 & 132 kV GIS equipment are under manufacturing process.

### 2) Samundratar- Trishuli 3B 132 kV Transmission Line

The project was conceptualized to evacuate power generated from several hydropower projects being developed in Tadi River Basin located in Eastern Part of Nuwakot District. The double circuit transmission line has the capacity to evacuate 270 MW power generated from hydropower projects which will be transmitted to Trishuli 3B Hub Substation, which is in final stage of construction in Pairebeshi, Nuwakot. The construction of this project was successfully completed in the F/Y 2077/78 with the connection arrangement made to one of the 132kV line bays of Upper Trishuli 3A HPP which is already connected to national grid at Matatirtha Substation. The 26 km long 132kV Double Circuit Transmission Line and 132/33/11kV,

2x 30MVA Substation constructed by the project were successfully commissioned and inaugurated by Rt. Hon. Prime Minister K.P. Sharma Oli on July 3, 2021. Two nos. of 11kV outgoing feeders, one towards Satbise on the western side of the substation and the other towards Ghyangphedi on the eastern side of the substation are under operation and delivering continuous electricity to those areas. This has drastically solved the unreliable power supply and under voltage problems in the supply areas.



**33 kV switchyard, control building, 132 kV Switchyard & TL Towers**

The major components of the project are Samundratar Substation with 2 nos. of 132/33kV, 30 MVA and 2 nos. of 33/11kV, 8 MVA transformers and 26 km double circuit 132kV transmission line (including 3 km of four circuits; two circuits to be utilized by Upper Trishuli 3B HPP). Similarly, transformer capacity of Chaughada Substation was upgraded to 8 MVA in 33/11kV level with replacement of instrument transformers and Switchgears by this project.

The EPC contract for the project was signed between NEA and ETERN-CCCE-FEPEC JV, China and the contract was effective on November 28, 2016. The financing agreement for this project was concluded on April 20, 2015 with European Investment Bank in coordination with Asian Development Bank to finance loan equivalent to USD 12 Million.

### 3) Marsyangdi Corridor 220 kV Transmission Line

Marsyangdi Corridor 220 kV Transmission Line Project was formulated to connect power generated by hydropower stations in Marsyangdi basin/ river and its tributaries to the Integrated Nepal Power System (INPS). This project

plans to construct approx. 113 km long Double Circuit 220 kV Transmission Line from Manang (Dharapani Substation) to Chitwan (New Bharatpur substation) via Khudi substation, Udipur substation and Markichowk substation 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 entire project has been divided into three packages. The first package consists of construction of about 67 km of 220 kV, double circuit transmission line with twin ACCC Drake conductors from Udipur to Bharatpur. Contract for this package has been awarded to M/s Pinggao Group Co. Ltd, China and construction work is in progress. All types of tower design and testing work has been completed. Construction of 31 nos. of tower foundations and erection of 15 towers have been completed in Lamjung district.

The second package consists of the construction of 220/132 kV substations at Udipur and Bharatpur. The Contract for This package has been awarded to M/s Larsen and Toubro Construction, India. Around 50% of work associated with supply and delivery has been completed while about 15% of the civil work has been completed.



**Pad Concreting of Leg A of AP-34D of Udipur-Bharatpur 220 kV Transmission Line Project**

The contract for the third package, consisting of construction of about 46 km of 220 kV, double circuit transmission line with twin conductors (ACCC Drake and ACSR Moose) from Dharapani, Manang to Udipur, Lamjung via Khudi, Lamjung and associated substations at Khudi and Dharapani has been signed with M/s TBEA Co., Ltd, China. About 5% of works associated with supply portion

has been completed. Survey works of transmission line and survey & soil investigation work of substation has been completed.

Both the sections of transmission lines and associated substations of the project are expected to be commissioned by end of FY 2078/079 (2021/22). The overall progress of the project till date is 29%.

#### 4) Marsyangdi - Kathmandu 220 kV Transmission Line

The objective of this project is to evacuate power from various hydropower projects in Marsyangdi Corridor to Kathmandu valley which ultimately reinforces INPS and improve reliability of transmission system. The scope of this project includes design, supply and construction of 82 km double circuit transmission line and 220 kV Air Insulated Substation (AIS) at Matatirtha (Kathmandu) & 220 kV Gas Insulated Substation (GIS) at Markichowk (Tanahu). The whole project has been split into two packages.



The first package covers construction of about 82 km of 220 kV Double Circuit twin “ACSR MOOSE” line from Markichowk to Matatirtha. The contract for this package had been awarded to M/s TATA Projects Limited, India on 30 June 2016 with the construction period of 30 months. However, project couldn't be completed on the scheduled time due to various reasons beyond control of NEA including but not limited to the effects of COVID-19 pandemic. Construction progress of this transmission line has been affected due to local issue at Siddhalekh RM-07, Pipaltar, Dhading district where two nos. of tower foundation along with erection and stringing work

has been halted due to public hindrance. Out of 231 towers, foundation and erection of 229 towers has been completed along with stringing of about 79 km conductor. The line is planned to be commissioned by the end of October 2021.

The second package consists of construction of 220/132/33 kV Air Insulated Substation (AIS) of 320 MVA at Matatirtha, Kathmandu and 220/132/33 kV Gas Insulated Substation (GIS) of 320 MVA at Markichowk, Tanahu. The contract for this package had been awarded to M/s Shenzhen Farad Electric Co. Ltd., China on 22 December 2016 which was terminated due to non-performance of the contractor on 17 January 2020. After re-bid, the contract for the same has been awarded to M/s China Machinery Engineering Corporation, China on 31 December 2020 with the construction period of 18 months. The contractor has started to submit design/drawing for the project. The substations are planned to be commissioned by September 2022.

#### 5) Kaligandaki Corridor 220 kV Transmission Line

The scope of the project includes construction of 220/132 kV, 100 MVA & 132/33 kV, 25 MVA Substation at Dana (Myagdi), 220/132 kV, 100 MVA Substations at Kushma (Parbat) and 127.57 km of 220 kV D/C transmission line (Dana - Kushma - New Butwal). The project has been divided into two packages. First package covers construction of 39.6 km of 220 kV transmission line from Dana to Kushma and associated 220 kV substation each at Dana & Kushma.



**220 kV Dana Substation**

The contract for this package was awarded to M/s JV of TATA Projects Limited & CHINT Electric Co. Ltd., India. Both substations and transmission line were successfully completed and inaugurated on 4 February 2021.



**220/132 kV Kushma Substation**

The contract for second package which includes design, supply and construction of 88 km, 220 kV D/C transmission line from Kushma to New Butwal has been awarded to M/S Larsen & Toubro Limited, India. For this package, check survey and cadastral survey has already been concluded. Foundation of 145 nos. out of 231 nos. towers has been completed. This transmission line is planned to be commissioned by the end of 2021.

#### **6) New Butwal – Bardaghat 220 kV Transmission Line and Substation**

The major objective of this project is to construct 21 km of 220 kV transmission line from New-Butwal to Bardaghat and 220/132 kV, 100 MVA substation in New Butwal, Nawalparasi.

The contract for construction of 220/132 kV, 100 MVA Substation in New Butwal (Nawalparasi) has been awarded to M/S Tata projects Limited, India. The substation is in advance stage of completion and planned to be commissioned by September 2021.

The contract of design, supply, installation and commissioning of 21 km of 220 kV transmission line from New Butwal to Bardaghat has been undertaken by M/S Powerchina Sepco1Electric Power Construction Co. Ltd. Though pre-construction activities like field survey, soil investigation, tree counting, etc. have been completed before second wave of COVID-19, supply of tower stubs and civil construction schedule is badly affected and yet to start. Due to delay in EIA approval and COVID-19 pandemic, project activities are being delayed. The transmission line is expected to be completed by December 2022.

#### **7) Grid Substation Reinforcement and Capacity Expansion Project**

The idea of this project was drafted 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. 280 MVA capacity was added in the grid when reinforcement and upgradation work of all these eight grid substation was concluded on December 2017. Protection upgradation and addition of Substation Automation System in Gandak SS and Baneswar SS were also completed successfully.

#### **8) Lapsipedi and Changunarayan Substation Construction**

The objective of this project is to construct 220/132 kV, 160 MVA & 132/11 kV, 22.5 MVA capacity GIS substation at Lapsipedi and 132/11 kV, 45 MVA SS at Changunarayan. Additional scope of upgradation of existing 66/11kV Teku Substation to 132/66/11kV voltage level and construction of new double circuit 132kV line bays at existing Suichatar 132kV substation for charging existing Suichatar-Teku 66kV Transmission Line on 132kV has also been included. 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, which will be initially charged at 220 kV. The addition of these substations will also help reinforce transmission network of Kathmandu valley and increasing the reliability of transmission network feeding power to Kathmandu valley. Further, since the areas around these substations are supplied from substations far from load center, addition of these substations aids to improvement of power quality in these areas.



**Construction of boundary wall at Changunarayan**

The contract for this project has been awarded to M/s Larsen and Toubro Limited, India on November 2020. Till date, detail survey and soil investigation work at Changunarayan, Suichatar and Teku s substation has been completed. Tower foundation, boundary wall as well as approach road works at Changunarayan substation are on the verge of completion. Other design of electrical and civil components of substations is under review/submission. These substations are expected to be completed by the end of December 2022.

### 9) Kathmandu Valley Transmission Capacity Reinforcement

As an essential project to cope growing demand in the outskirts of the Kathmandu valley and to reduce burden on the existing substations, this project will augment grid substation capacity by adding 3 new 132/11kV substations, 2x45 MVA each at Mulpani, Futung and Chapagaon. These substations will not just increase the reliability of distribution network but also serve to supply qualitative electricity to the consumers. The Contract of these Substations is being executed by M/S Pinggao Group Co. Limited, China.



*View of Phutung Substation*

Manufacturing of major equipment such as power transformer and GIS has already been completed and design/drawings of most of other electrical equipment has also been concluded. Approval for designs and drawings related to civil works such as sub/superstructure has been obtained. Due to geological and social problems, civil works at the sites were delayed thus extending contract completion period up to 25th January 2021. Land acquisition of Chapagaon Substation was delayed and contractor was provided with alternative construction plot at Thimi switching station. Further, due to the soil strata and necessity of extra works that were not envisaged in the contract, location from Mulpani had to be changed

to Chovar. Official process has been started to obtain construction plot from Government of Nepal. Ongoing COVID-19 pandemic has further affected the project activities causing delay in the completion time.

### 10) Kathmandu Valley Substation Automation

NEA has strongly felt the need of a smarter and more reliable grid system that will lead the existing system not only towards digitization and modernization but also towards centralized supervision based process for monitoring and control of power system parameters essential to maintain health of integrated system by providing uninterrupted and quality power to end-users. Further, this project is crucial for NEA in terms of reduction of ongoing operational cost, improvement of grid reliability, lengthening the life of equipment, and improvement of organizational effectiveness. Under this project, all thirteen (13) grid SS within Kathmandu Grid Division will be fully automated and be operated remotely from Control Centre located at Baneshwor S/S. The contract of this project has been awarded to M/S GE T&D India Limited on 5 January 2020 and is expected to be completed within March 2022.

### 11) Kathmandu Valley Transmission Capacity Reinforcement (Phase II)

The project is the continuation of Kathmandu Valley Transmission Capacity Reinforcement Project and serves the same objective, to augment grid substation capacity of Kathmandu Valley. The primary focus of this project is to reduce burden in existing Bhaktapur-Baneshwor-Patan single circuit 66 kV transmission line. The scope includes construction of 132 kV double circuit underground cable transmission line approximately 12 km from existing Bhaktapur Substation to newly proposed 132 kV GIS Substation at Koteshwor with 2x45 MVA, 132/11 kV and 2x63 MVA, 132/66 kV Transformer via Thimi Substation. The project also includes approximately 2 km of 66 kV double circuit underground transmission line from newly proposed Koteshwor Substation to existing Baneshwor Substation and necessary bay extension works at both ends of the transmission line.

Survey license for the transmission line has already been acquired and ESSD, NEA is conducting IEE study for the line. Due to unavailability of land in targeted area of Koteshwor/Tinkune area, project is assessing other alternatives for the construction plot of Koteshwor substation. Preliminary survey has been completed and bidding document preparation is underway. The detail



survey of Chovar-Patan-Chapagaun double circuit 132 kV underground transmission line with total length of 12.5 km is being conducted by NEA Engineering Company (NEAEC). After obtaining survey license detailed survey as well as IEE study will be conducted.

## **12) Upgrading of Khimti-1, Bahrabise and Lapsiphedi Substation to 400 kV**

To evacuate power generated by IPPs including Tamakoshi and Middle Bhotekoshi, the Khimti – Bahrabise – Lapsiphedi transmission line have to operate at 400 kV and accordingly the substations at Khimti, Bahrabise and Lapsiphedi need to upgrade to 400 kV voltage level. To meet these power evacuation requirements, Khimti-Bahrabise-Lapsiphedi 400 kV substation project has been initiated.

The scope of this project is to construct (i) New Khimti 400/220 kV substation including 2 nos. of 400kV line bays to terminate double circuit Quad Moose ACSR transmission line along with construction of two numbers ICT bays for connecting two single phase Auto-transformers' bank of 315 MVA each with 3\*105 MVA plus 1\*105 MVA spare unit with total capacity of 630 MVA (ii) Bahrabise 400/220 kV substation including 4 numbers of 400kV line bays to terminate double circuit Quad Moose ACSR transmission line, construction of two numbers of ICT bays for connecting two single phase Auto-transformers' bank of 3\*53.33 MVA plus 1\*53.33 MVA spare unit with total capacity of 320 MVA and construction of 1 bay for connecting 1 nos. of 420 kV, 50 MVAR, 3-phase Shunt Reactor along with supply and installation of the reactor (iii) Lapsiphedi 400/220 kV substation including 2 numbers of 400kV line bays to terminate 400 kV double circuit Quad Moose ACSR transmission line along with construction of one number of ICT bay for connecting a single phase auto-transformers bank of 315 MVA with 3\*105 MVA plus 1\*105 MVA spare unit with total capacity of 315 MVA.

Contract agreement was signed between NEA and M/s Grid Solutions SAS, France on 2 October 2020. Till date, preliminary survey works have been completed at New Khimti and Bahrabise substation while soil investigation works is also ongoing. Engineering drawing/documents are being submitted and approved.

## **13) 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 construction of Parwanipur-

Pokhariya 132 kV Transmission Line along with the 132 kV substation at Pokhariya (Parsa district) to meet the current demand of industrial growth. Nijgadh-Pokhariya 400 kV Transmission Line along with the concomitant substations in Nijgadh and Pokhariya has been planned for future electricity demand of industries.

Proposed 132 kV double circuit transmission line from Parwanipur to Pokhariya of 21 km in length will be constructed using HTLS conductor. The survey of the line is already completed, which was carried out by Engineering Directorate of NEA. The IEE study of the line has also been concluded by Environment and Social Studies Division (ESSD) and approved by GoN. Bids for construction of 132 kV line and 132 kV Substations at Pokhariya is planned to be invited by October 2021 immediately after land acquisition for Pokhariya substation.

Likewise, study of the 400 kV Nijgadh-Pokhariya transmission line of approximately length of 75 km has also been initiated. The detailed survey is being carried out by Engineering Directorate of NEA and expected to be completed by September 2021.

## **14) Grid Substation Automation (Phase II)**

The purpose of this project is to automate grid substations of various Grid Division Offices outside Kathmandu valley built over a strong and vibrant communication backbone. The scope of Substation Automation System (SAS)- Phase II includes controlling and monitoring of 132 kV, 66 kV & 33 kV Transmission and Distribution system of 49 grid substations, construction of 6 Master Control Center (MCC) at each division office and integration of all 400kV /220kV/132kV/66kV/33kV/11kV substation with MCC and Load Dispatch Center (LDC) with replacements and retrofitting of control & relay panels, switchgear panels, isolators and other electrical & mechanical auxiliary systems which are not compatible to SAS.

Through SAS implementation, all grid substations will be unmanned and controlled from Master Control Center (MCC). NEA aims to mirror benefits such as reduced operating staffs at substations, improving operating decision ability and quality of service provided to consumers, while maintaining acceptable levels of risk and reliability with technical database. Survey of existing substation has finished so far. PMD has planned to invite bids for this project by November 2021.

### 15) Dandakhet-Rahughat 132 kV Transmission Line and Substation

This project has been designed primarily to evacuate power generated from IPPs from Rahuganga and Kaligandaki river basins of Myagdi district, Dhaulagiri zone.

The scope of this project includes construction of 25 km, 132 kV double circuit transmission line using ACSR cardinal conductor from Dandakhet to Rahughat through LILO arrangement in 220 kV Kaligandaki transmission line, 132/33 kV, 30 MVA substation at Dandakhet and 220/132 kV, 200 MVA substation at Rahughat. Bids for construction of substation and transmission line are under evaluation. Land acquisition of Rahughat substation has been completed while in case of Dadakhet substation, with the acquisition of required land, construction of staff quarter, guard house and boundary wall has been concluded.

### 16) Ghorahi – Madichaur 132 kV Transmission Line and Substation

This project is initiated by Nepal Government under Energy Crisis Eradication budget head to electrify Rolpa district, since it hasn't been connected to National grid yet. The main objective of this project is to reinforce power supply system and power evacuation from different IPP's at Madi Khola and Lungri Khola of Rolpa district and its tributaries. This project will evacuate approximately around 200 MW of power generated to the INPS.

The project comprises of construction of approximately around 40 km long 132 kV double circuit Transmission Line with ACSR Cardinal from Ghorahi substation, Dang to proposed Khungri substation, Rolpa and 132/33 kV, 30 MVA AIS substation hub at Khungri of Rolpa along with 132 kV bay extension at Ghorahi Substation.

Land for Khungri substation at Khungri, Rolpahas been acquired. Civil works of constructing boundary wall, store building along with others protection works at substation land is completed. The detail survey of the transmission line route and Initial Environment Examination (IEE) of the project has also been completed. Bids for construction of substation and transmission line are under evaluation.

### 17) Borang – Lapang 132 kV, Lapang – Ratmate 220 kV Transmission Line and Substation

The project aims to evacuate power generated by IPP's of Aankhu Khola Corridor & Budhigandaki corridor to INPS. The scope of this project includes construction of 24 km

220 kV double circuit transmission line with Twin MOOSE conductor from proposed Lapang, Biharthok substation to proposed Ratmate substation and construction of 24 km 132 kV double circuit Transmission Line with BEAR conductor from proposed Borang substation to proposed Lapang substation along with the construction of Borang 132/33/11 kV AIS substation and Lapang Biharthok 220/132/33/11 kV GIS substation.

As of now, detailed survey, feasibility study and IEE has been completed. In addition, land acquisition has been completed for both Borang and Lapang, Biharthok substation. Technical evaluation of the bidder's proposal is ongoing.

### 18) Construction of 132 kV Pangtang Substation

The purpose of this project is to evacuate power from different IPPs of Balefi Corridor in Sindhupalchowk. This project will include construction of a 132/33 kV, 30 MVA & 33/11 kV, 8 MVA substation at Pangtang and necessary bay extension works at Barhabise substation. Till date, 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. Bids invited for the construction of substation are under evaluation.

### 19) Construction of 132 kV Keraun Substation

This project intends to reinforce power supply system to supply adequate and reliable power in Morang district and to minimize overloading problem of existing Duhabi 132/33kV grid substation as well as 33/11 kV Rani, Rangeli and Biratchowk substations. The project covers construction of Keraun 132/33kV, 2X63 MVA and 132/11kV, 22.5 MVA AIS sub-station, Keraun-Rangeli 15 km double circuit & Keraun-Biratchowk 25 km double circuit 33kV sub-transmission line. Till date, layout design and single line diagram of substation, geo-investigation works have been approved and detail designs and drawing of civil works are in approval process. For the main substation work and 33 kV line, contract has been recently signed on June 11, 2021. The project is expected to be completed by September 2023.

### 20) 132/66 kV Transmission Line Upgradation

Transmission network in Kathmandu valley currently comprises of ACSR Bear, Panther, Wolf and Dog conductors. Most of these lines are overloaded and can't handle contingency conditions. In few instances, even the normal loading creates system instability. In order



to mitigate these problems and abnormalities, 7 km Suichatar-Matatirtha 132 kV TL, 5 km Suichatar-Balaju 132 kV TL, 13 km 132 kV Suichatar-Patan TL and 8.5 km Suichatar- Teku 66 kV TL within Kathmandu valley has been planned to upgrade by replacing existing conductor with HTLS conductor.

In addition to transmission line in Kathmandu valley, 120 km of Pathaiya-Dhalkebar 132 kV DC transmission line built with ACSR Bear conductor is another important transmission line section as the supply can be routed from either Hetauda to Dhalkebar or Dhalkebar to Pawanipur substation. Currently, major power source is Dhalkebar SS and sometimes, it becomes necessary to supply upto Butwal through the Dhalkebar - Patlaiya line. This is also the main line to supply Birgunj area where numbers of industries are facing power shortages and this line tends to operate in overloading. Thus, to avoid overloading and outages during contingency and normal loading condition, this line has also been planned to upgrade using HTLS conductor. Further, another transmission line planned for upgradation is 30 km of Kushaha- Duhabi 132 kV TL section constructed with ACSR Bear conductor. It becomes imperative to upgrade this transmission line section as this line is the main export / import point for power trade with India and connected with Kataiya substation in India. This line also acts a major power carrier for the substations supplying Duhabi and Biratnagar area. Bids for this project had already been invited on 10 August 2021 but contract with the bidder could not succeed. Therefore, annulment notice was published on 1 July 2021 and re-tender for same has been floated again on 12 July 2021.

### 21) Kohalpur – Nepalgunj 132 kV Transmission Line

This project is necessary to improve power quality and reliability of Banke district. After construction of this substation at Janaki Gaupalika area, it can feed power to the industrial sector at Nepalgunj as well as to nearby 33/11 kV substations. This project was initiated in FY 2075/076 (2018/19) and later funded by ADB. The estimated cost of the project is US\$ 12 Million. This project includes construction of about 10 km long double circuit 132 kV transmission line with ACSR Bear conductor and construction of 2x132/33 kV, 63 MVA substation at Bakaspur. As of July 2021, detail survey and IEE works are in progress. Land for New Nepalgunj substation has been identified at Banke, Janaki Rural Municipality Ward No. 6, Bakaspur. Land acquisition for substation is in progress.

### 22) Arun Khola (Dumkibas) 132 kV Substation

This project is focused on the development of 132/33/11 kV Substation at Dumkibas of Binayee Triveni Rural Municipality to meet increasing power demand of industrial consumers in Dumkibas and Arunkhola areas, improve voltage in middle and western parts of Nawalparasi (Bardghat-Susta east) district, enhance quality and reliable power supply and minimize overloading problem of Bharatpur-Kawasoti-Bardghat 132 single circuit transmission line of INPS.

The scope of this project includes construction of a 132/33/11 kV, 2x30 MVA substation at Tamang Danda of Dumkibas, Ward No.2 of Binayee Triveni Rural Municipality in Gandaki province of Nepal. The proposed 132/33/11 kV Substation will fed from exiting NEA Bardghat-Sardi 132 kV double circuit transmission line. This project is also focused to construct 11 kV feeders of distribution line to Dumkibas Bajar, Arunkhola Bajar areas and community consumers from the 132/33/11 kV Substation at Dumkibas.

As of July 2021, required land acquisition works for the 132/33/11 kV substation at Tamang Danda of Dumkibas is in final stage while bidding document preparation is underway. The substation facility is planned to be commissioned by the end of July 2023.

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

The prime focus of services under PPFE is to prepare projects to the high level of readiness for procurement and execution. High leveled readiness project is easy to implement, cost effective and ensure timely completion of the project with adequate quality. PMD has been engaged for the project preparation of many strategically important transmission line and substations where the consulting firm has been appointed for detail engineering and environmental study of the proposed Transmission Line and associated Substations with the grant aid of ADB (Grant No. 0361: Project Preparatory Facility for Energy). Under the detail engineering and environmental study, the consulting firm will prepare detail project report including detail transmission & substation design with tower spotting and demarcation in site, soil tests, all necessary civil and electromechanical design, safeguard studies, preparation of cost estimate, preparation of bidding documents and necessary activities in detail enough to provide adequate information & data to ensure

high readiness of the project for procurement so that construction can be commenced smoothly immediately after the contract award. Engineering and environmental study of following transmission line and the associated substation are underway.

### i) New Butwal – Lamahi – Kohalpur – New Attariya 400 kV Transmission Line

As a part of development of East – West 400 kV trunk line, PMD is proud to be associated with the detail due diligence study of 400 kV transmission lines and substations in the western part of the country i.e. from New Butwal (Bhumahi) to New Attariya (Daiji) with 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 completed detail survey, soil investigation works, tower and foundation design works and bid documents works of Chhinchu - Surkhet 132 kV DC transmission line and has submitted the documents to the project for final approval. Similarly, consultant has also completed detail survey & soil investigation works of New Butwal - Lamahi 400 kV transmission line.

For the substation part, consultant has submitted design of Dododhara (New Lumki) 400 kV substation and Surkhet 132kV substation. Furthermore, the consultant has also submitted a review report of the existing tower design. The detailed study on due diligence related activities and engineering design on the remaining transmission line and substation design is targeted to be completed by this fiscal year. 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 – Chhinchu 400 kV DC Transmission Line (95 km)
- Chhinchu – Dododhara (New Lumki) 400kV DC Transmission Line (91 km)
- Chhinchu - Surkhet 132kV DC Transmission Line (25 km)
- Dododhara (New Lumki) – New Attariya(Daijee) 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
- Chhinchu 400 kV Substation
- New Attariya (Daijee) 400 kV Substation

### ii) Other Transmission Line and associated Substations

NEA has initiated the detail engineering design and environmental study of other three (3) different 400 kV transmission lines and two (2) 132 kV transmission lines and associated substations. Consultant recruitment has been done in three (3) separate packages, CP-1, CP-2 and CP-3. The details of line and substation under each consulting packages are as follow:

#### Consulting Package (CP-1)

- (i) Tingla Hub - Likhu Hub - New Khimti 400kV 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 400kV 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 (Phelim-Gumda-Ratamate) (approximately 95 km) transmission line and associated 400 kV substations at Phelim/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/Ramechhap (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)

- (i) 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.

Contract for all three consulting packages has been signed with Power Grid Corporation of India Limited, India in association with Jade Consult Pvt. Ltd., Nepal on November 2019. Power evacuation study, walkover survey etc. have been completed and detail survey is going on for all three packages. The study is planned to be completed by December 2021.

### iii) Power Transmission System Planning for Major Cities of Nepal

The existing capacity of transmission lines and substations in the city areas will be insufficient to meet the growing energy demand as well as peak demand. Therefore, there is no alternative to upgrading the capacity of existing transmission lines and substations as well as construction of new transmission lines and substations. The power transmission infrastructures requires a lot of land and right of way along the line. It is very hard to find the land and RoW in the cities to construct transmission infrastructures which will be an evident problem in the future. Hence, NEA has decided to plan the transmission infrastructure considering the future demand of electricity till 2050 AD and develop infrastructure accordingly phase wise. Similarly, it has become essential to find some alternatives to avoid land and RoW problems in transmission infrastructure by adopting modern practices like underground transmission line, compact substation, transmission system using monopoles, etc.

This project will prepare a power transmission system plan of major cities and associated industrial areas of Kathmandu valley, Banepa, Pokhara, Biratnagar, Itahari, Dharan, Biratchowk and adjacent cities, Janakpur, Bardibas, Hetauda, Simara, Parwanipur, Birgunj, Butwal, Bhairahawa, Nepalgunj and Kohalpur, taking into account the future load growth till 2050 AD including feasibility study and project preparation.

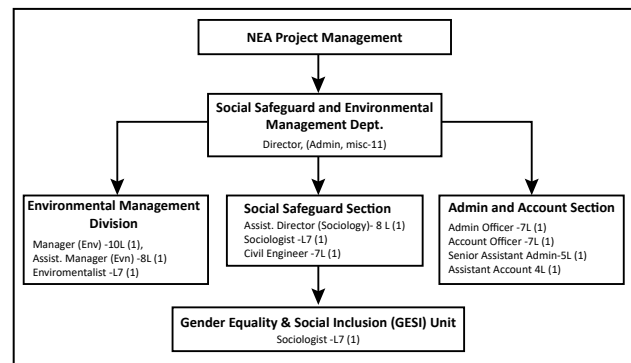
The contract was signed on 2 April 2021 between NEA and WAPCOS Limited, India which became effective on 21 April 2021. Tentative cost for the assignment is US\$ 1.2 million. Relevant input data are being collected for assignment and complete scope of works is planned to be completed in June 2022.

### Social Safeguard and Environmental Management Department (SSEMD)

Due to need of institutional structure under Project Management Directorate (PMD) and NEA's strong commitment to address environmental and social safeguard issues effectively, Social Safeguard and

Environmental Management Department (SSEMD) within PMD has been approved by NEA's board on 23rd February 2021. The department headed by a director and supported by dedicated environmental and social safeguards officers, civil engineer, and administrative and accounting and other support staffs. The approved organizational structure of the department is as;

Figure: Approved Structure of SSEMD by NEA's Board



### The jurisdiction of the Department

1. Environmental studies and Monitoring (internal and external), Mitigation and Reporting of Safeguard activities of Transmission Line, Sub-Station and Distribution System Projects and implementation to Community Support Responsibility (CSR) programs under the PMD.
2. Arrange to meaningful public consultation , Key In format Interview , Trainings and Awareness Programs,
3. Ensure information records and data base of the safeguard implementation activities,
4. Implementation to Gender Equality and Social inclusion (GESI) related activities for mainstreaming as per ADB Manual/ guidelines,
5. Waste management and compensatory plantation in project site
6. Grievance Redress and Management (issue identification, documentation and status),
7. Other Environmental and Social Issues with RAP and Rehabilitation.

Currently, the department is in process of recruiting all the approved personnel under the Departmental structure. The department is working on formalizing administrative procedures and financial management for operationalization of the department in full fledge. It is anticipated that with all logistics and manpower onboard, all projects under PMD safeguard issues will be managed effectively by the department.

### 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	1136	272	1408
		220 kV	509	656	1165
		400 kV	576	180	756
Total (Circuit km)			2221	1108	3329
2	Planed and Proposed Transmission Line (Circuit km)	132 kV	1020	320	1340
		220 kV	405	0	405
		400 kV	1090	1920	3010
Total (Circuit km)			2515	2240	4755

#### Substation

S.N	Description	Transmission Directorate	Project Management Directorate	Total
1	Under construction (MVA)	4457.00	4743.00	9200.00
2	Planed and Proposed (MVA)	2160.00	5910.00	8070.00



## Annexure A: List of Figures

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- Figure 2: System Load Curve (Dry Peak Demand) Magh 18, 2078 (January 31, 2021), Sunday
- Figure 3: Capacity Balance (MW) in FY 2077/2078 (2020/21)
- Figure 4: Energy Balance (GWh) in FY 2077/2078 (2020/21)
- Figure 5: Comparison of Energy Demand and Peak Demand between FY 2076/77 and FY 2077/78
- Figure 6: Status of Imported Energy from different import Points in FY 2077/78
- Figure 7: Status of Export Energy from different import Points in FY 2077/78

Figure 1: System Load Curve (Maximum Demand) Baishakh 13, 2078 (April 26, 2021) Monday

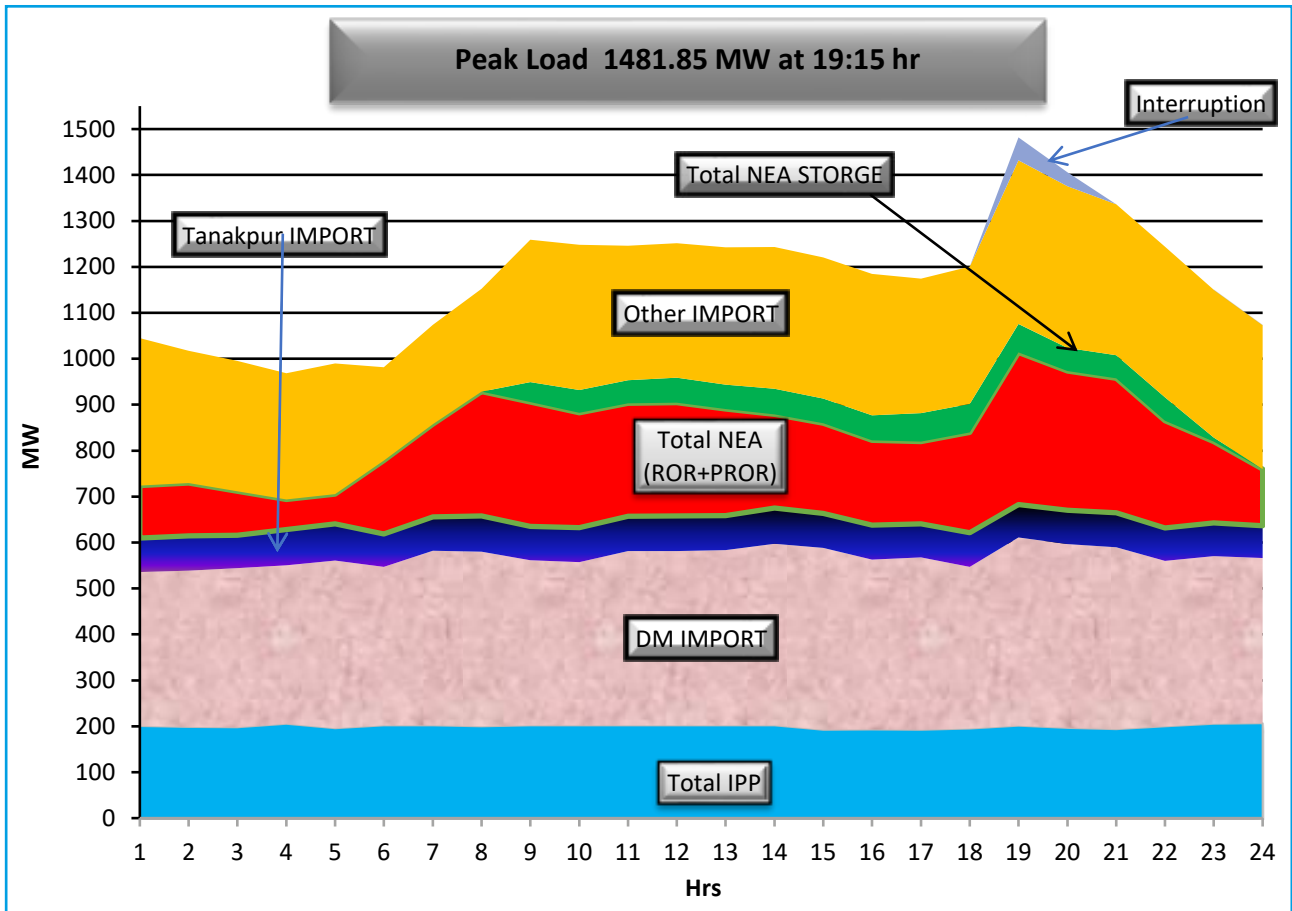


Figure 2: System Load Curve (Dry Peak Demand) Magh 18, 2078 (January 31, 2021), Sunday

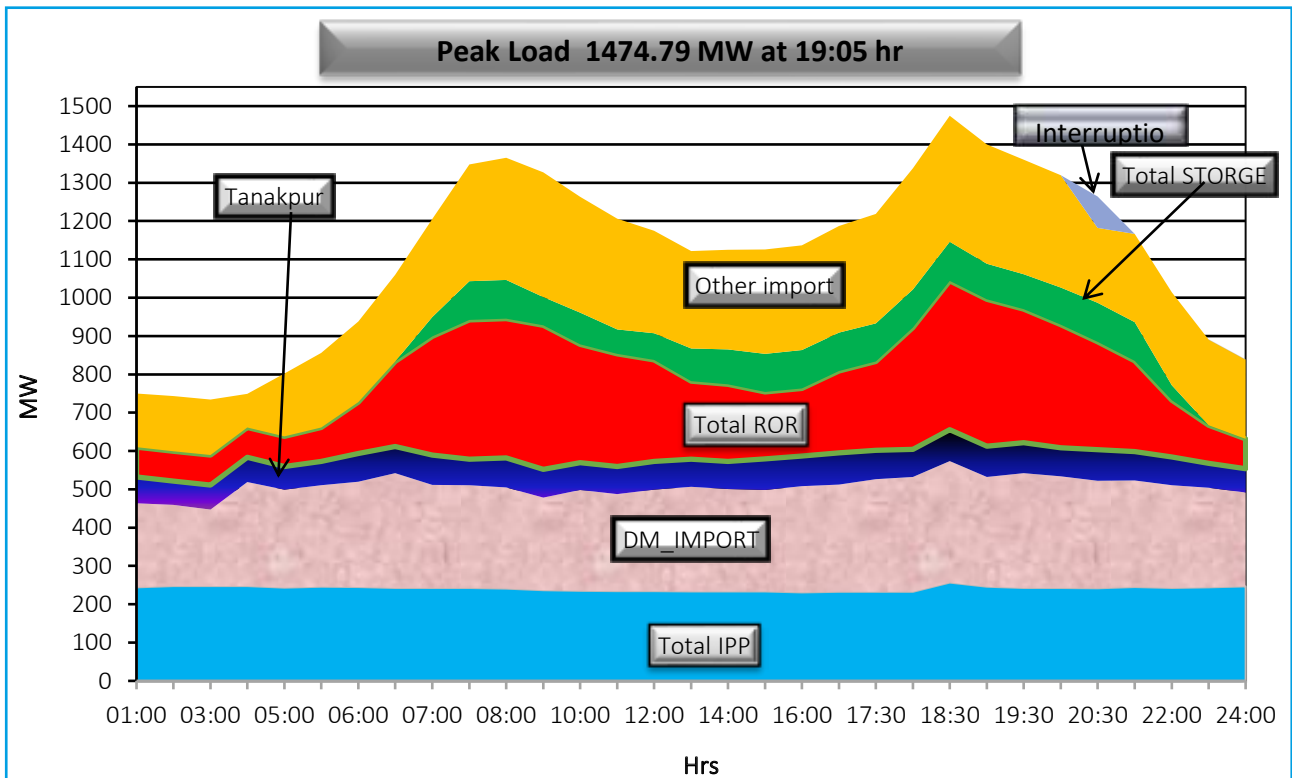
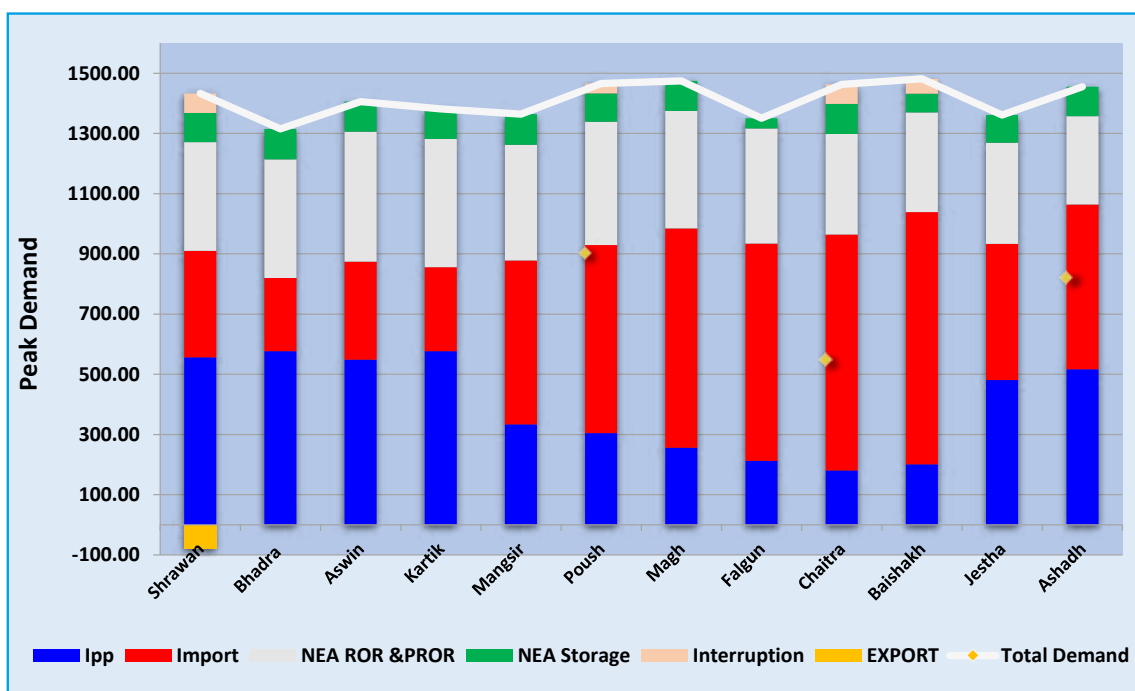


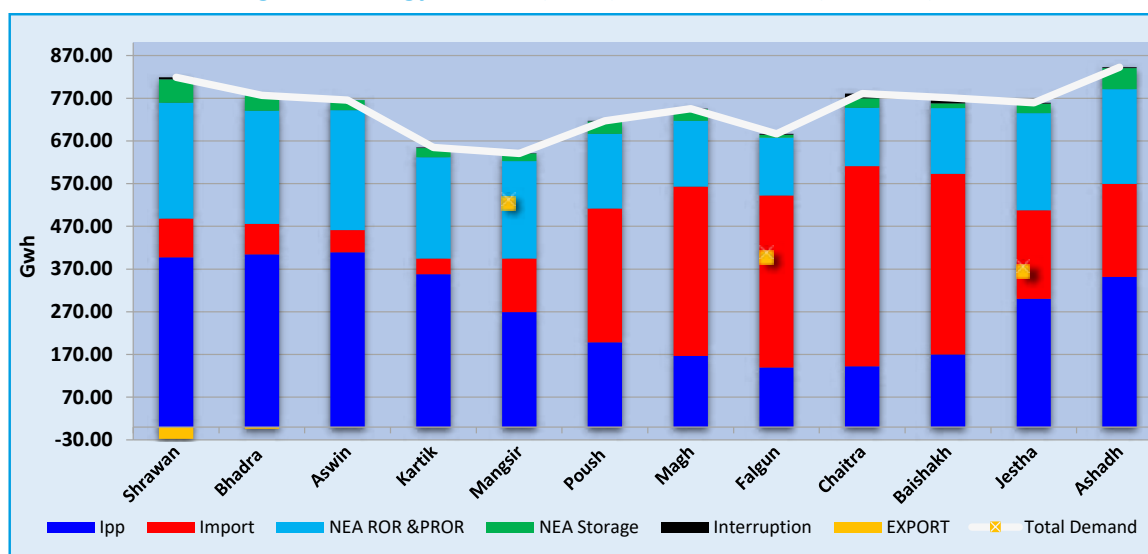
Figure 3: Capacity Balance (MW) in FY 2077/2078 (2020/21)

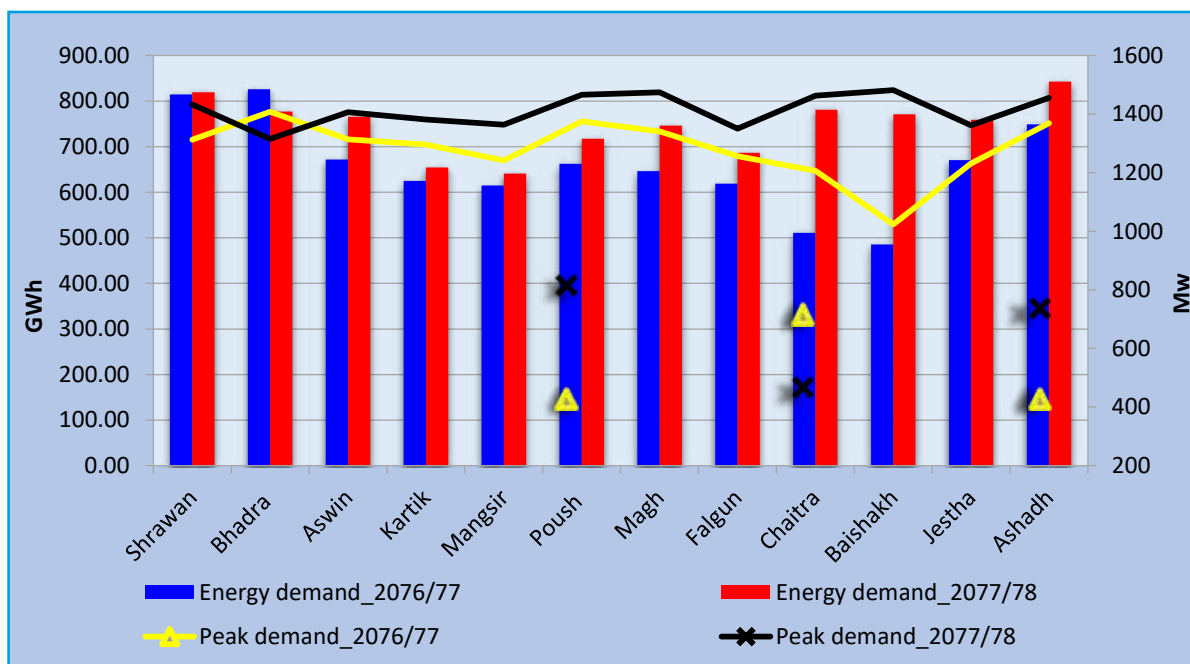


Energy Balance (Gwh) in FY 2077/2078(2020/21)

Energy source/Months	Shrawan	Bhadra	Aswin	Kartik	Mangsir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Ashadh	Total
IPP	397.48	404.60	409.25	358.01	268.92	198.80	166.60	139.78	142.14	170.22	300.43	352.04	3308.27
Import	91.10	71.15	52.25	36.38	125.45	313.06	396.77	402.79	468.61	422.99	207.60	217.64	2805.79
NEA ROR & PROR	271.08	265.04	280.59	237.39	228.78	174.74	153.60	134.92	137.05	153.39	226.89	221.65	2485.10
NEA Storage	54.76	35.88	23.84	21.87	17.54	29.34	27.80	6.78	22.31	11.47	22.24	49.47	323.28
Interruption	4.59	0.00	0.00	0.76	0.12	1.41	1.12	2.07	11.00	13.04	1.96	1.82	37.87
<b>Total Demand</b>	<b>819.01</b>	<b>776.66</b>	<b>765.92</b>	<b>654.41</b>	<b>640.79</b>	<b>717.35</b>	<b>745.89</b>	<b>686.33</b>	<b>781.11</b>	<b>771.11</b>	<b>759.12</b>	<b>842.62</b>	<b>8960.31</b>
EXPORT	-27.29	-3.90	-0.81	-0.74	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	-32.87
<b>Net Demand</b>	<b>737.66</b>	<b>697.14</b>	<b>765.10</b>	<b>652.91</b>	<b>640.66</b>	<b>715.93</b>	<b>720.57</b>	<b>684.26</b>	<b>770.11</b>	<b>758.07</b>	<b>757.16</b>	<b>842.74</b>	<b>8742.30</b>

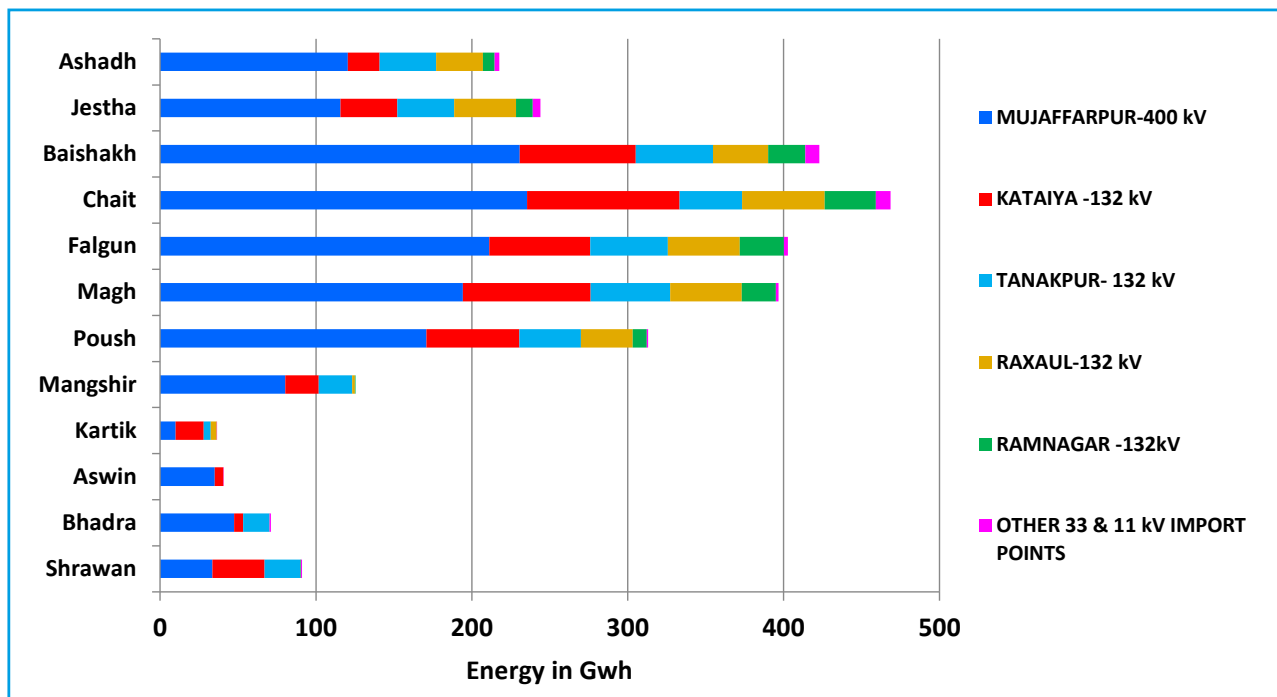
Figure 4: Energy Balance (GWh) in FY 2077/2078 (2020/21)



**Figure 3: Comparison of Energy Demand and Peak Demand between FY 2076/77 and FY 2077/78**


	Energy demand 2076/77	Energy demand 2077/78	Peak demand 2076/77	Peak demand 2077/78	Energy Demand increase(+)/ decrease (-) in %	Peak Demand increase(+)/ decrease (-) in %
Shrawan	814.30	819.01	1313.08	1432.99	0.58	8.37
Bhadra	826.14	776.66	1407.94	1315.32	-6.37	-7.04
Aswin	671.72	765.92	1313.6	1406.19	12.30	6.58
Kartik	624.62	654.41	1295.72	1381.83	4.55	6.23
Mangsir	614.49	640.79	1242.1	1363.88	4.10	8.93
Poush	662.42	717.35	1374.9	1466.33	7.66	6.24
Magh	646.60	745.89	1340.75	1474.79	13.31	9.09
Falgun	618.53	686.33	1256.32	1350.77	9.88	6.99
Chaitra	510.87	781.11	1206.2	1463.01	34.60	17.55
Baishakh	485.53	771.11	1023.63	1481.85	37.03	30.92
Jestha	670.36	759.12	1231.63	1361.80	11.69	9.56
Ashadh	748.89	842.62	1369.52	1455.57	11.12	5.91
<b>Total</b>	<b>7894.47</b>	<b>8960.54</b>				
<b>Average</b>			<b>1281.28</b>	<b>1412.86</b>	<b>11.70</b>	<b>9.11</b>

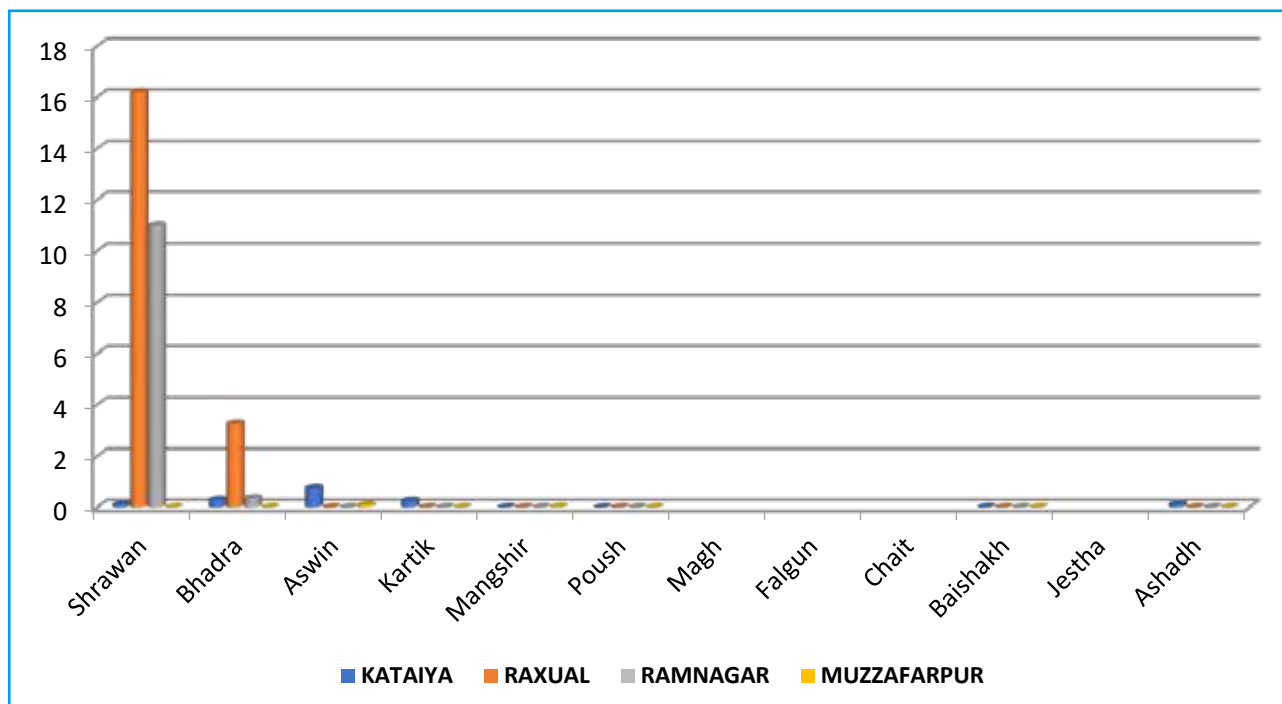
Figure 6: Status of Imported Energy from different import Points in FY 2077/78



## Energy Export to India (GWh)

	MUJAFFARPUR 400 kV	KATAIYA 132 kV	TANAKPUR 132 kV	RAXAUL 132 kV	RAMNAGAR 132kV	OTHERS 33 & 11 kV IMPORT POINTS	TOTAL IMPORT
Shrawan	33.51	33.54	23.23	0.01	0.12	0.71	91.10
Bhadra	47.55	5.85	16.72	0.00	0.06	0.96	71.15
Ashwin	35.09	5.48		0.00	0.00	0.14	52.25
Kartik	9.92	18.12	4.39	3.92	0.00	0.02	36.38
Mangshir	80.40	21.34	21.46	1.83	0.40	0.00	125.45
Poush	170.81	59.66	39.59	33.20	9.00	0.80	313.06
Magh	194.31	81.88	51.13	45.84	21.84	1.78	396.77
Falgun	211.26	64.66	49.91	45.95	28.35	2.66	402.79
Chaitra	235.49	97.79	40.07	53.10	32.78	9.39	468.61
Baishakh	230.74	74.45	49.47	35.37	23.85	9.10	422.99
Jestha	115.69	36.50	36.50	39.66	10.81	4.95	207.60
Ashadh	120.37	20.46	36.29	30.00	7.53	2.99	217.64
Total	1485.15	519.73	368.76	288.88	134.74	33.49	2805.79

Figure 7: Status of Export Energy from different import Points in FY 2077/78



	KATAIYA	RAXUAL	RAMNAGAR	MUZZAFARPUR	Total
Shrawan	0.09872	16.19955	10.992778	0	31.190404
Bhadra	0.28792	3.26342	0.348016	0	4.713916
Ashwin	0.7407	0	0	0.07386	1.06456
Kartik	0.25	0	0	0	0.26448
Mangshir	0.00488	0	0	0.0096	0.01848
Poush	0.004	0	0	0	0.004
Magh					0
Falgun					0
Chaitra					0.00896
Baishakh	0.00896	0	0	0	0.00896
Jestha					0.10272
Ashadh	0.10272	0	0	0	32.487844
Total	1.4979	19.46297	11.340794	0.08346	32.385124



## Annexure B: List of Table

- Table 1: Existing high voltage transmission lines
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- Table 8: Major ongoing upgradation and reinforcement works of grid substations
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- Table 10: Details of Approved Position and Working Employees under Transmission Directorate

Table 1: Existing high voltage transmission lines

S.N.	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
<b>A</b>	<b>132 kV Transmission Line</b>				
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- Syaule- Attaria	Single	131.00	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



S.N.	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
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
40	Samundratar - Trishuli 3B Hub	Double	52.00	AAAC Upas	300
41	Singati-Lamosangu	Single	40.00	BEAR	250
<b>Total (132 kV)</b>			<b>3129.54</b>		
<b>B</b>	<b>400/220 kV Transmission Line</b>				
1	Dhalkebar-Muzzaffarpur 400 kV Cross Border Line (400 kV)	Double	78.00	MOOSE	500
2	Khimti- Dhalkebar 220 kV Transmission Line	Double	150.00	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	Dana-Kushma 220 kV Line	Double	79.6	Moose	
<b>Total (220 kV)</b>			<b>332.60</b>		
<b>C</b>	<b>66 kV Transmission Line</b>				
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
<b>Total (66 kV)</b>			<b>514.46</b>		

Table 2: Under construction high voltage transmission lines

S.N.	Transmission Line	Type of Ckts	Length (Circuit km)			Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)	Expected Completion Year (FY)
			Total	Constructed till FY 77-78	Constructed in FY 77-78 only			
<b>I</b>	<b>Transmission Directorate</b>							
<b>A</b>	<b>132 kV Transmission Line</b>							
1	Solu Corridor	Double	180	168	122	CARDINAL	420	2021/22
2	Dordi Corridor	Double	20	17	17	CARDINAL	420	2021/22
3	Singati-Lamosangu 2nd Circuit	Single	40	25	25	BEAR	250	2021/22
4	New Modi-Lekhnath	Double	84	35	35	BEAR	250	2021/22
5	Bardaghat-Sardi	Double	40	13	13	BEAR	250	2021/22
6	Kusaha-Kataiya Second Circuit (Cross Border-Nepal Portion)	Single	13	11	11	BEAR	250	2020/21
7	Chameliya- Syaule- Attaria 2nd Circuit	Single	131	124.5	0	BEAR	250	2021/22
8	Ramechap-Garjyang-Khimti	Double	62	1.5	1.5	BEAR	250	2021/22
9	Thankot-Chapagaon	Double	56	16		BEAR	250	2021/22
10	Raxual-Parwanipur Second Circuit (Cross Border-Nepal Portion)	Single	16			BEAR	250	2021/22
11	Butwal-Lumbini	Double	40			BEAR	250	2020/21
12	Burtibang-Paudi Amarai-Tamghas-Sandhikharka-Gorunsinghe	Double	168			BEAR	250	2021/22
13	Kushaha- Biratnagar	Double	46			BEAR	250	2021/22
14	Dhalkebar-Loharpatti	Double	40.00			CARDINAL	420	2021/22
15	Kohalpur-Surkhet	Double	104.00			BEAR	250	2021/22
16	Balefi Corridor	Double	40.00			CARDINAL	420	2021/22
17	Mainahiya Sampatiya	Double	56.00			BEAR	250	2021/22
<b>Total</b>			<b>1,136.0</b>	<b>411.0</b>	<b>224.5</b>			
<b>B</b>	<b>220 kV Transmission Line</b>							
1	Koshi Corridor (Inaruwa-Basantapur-Baneshwor-Tumlingtar)	Single	106	104	33	MOOSE	500	2021/22
2	Bharatpur-Bardaghat	Double	148	138	138	BISON	350	2021/22
3	Hetauda-Bharatpur	Double	148	10		BISON	350	2021/22
4	Chilime-Trishuli	Double	72			BISON	350	2021/22
5	Koshi Corridor (Basantapur-Dhungesangu)	Single	35			MOOSE	500	2021/22
<b>Total</b>			<b>509</b>	<b>252</b>	<b>171</b>			



S.N.	Transmission Line	Type of Ckts	Length (Circuit km)			Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)	Expected Completion Year (FY)
			Total	Constructed till FY 77-78	Constructed in FY 77-78 only			
<b>C</b>	<b>400 kV Transmission Line</b>							
1	Hetauda-Dhalkebar-Inaruwa	Double	576			MOOSE	500	2020/21
<b>Total</b>			<b>576</b>					
<b>II</b>	<b>Project Managment Directorate</b>							
<b>A</b>	<b>132 kV Transmission Line</b>							
1	Lapsifedi - Changunarayan - Duwakot	Double	28			BEAR	250	2021/22
2	Parwanipur - Pokhariya **	Double	42			ACCC Amsterdam	376	2023/24
3	Bhaktapur - Thimi - Koteswar**	Double	24			Single Core XLPE	500 sq. MM Cu	2022/23
5	Dandakhet - Rahughat **	Double	50			CARDINAL	420	2023/24
6	Ghorahi - Madichaur**	Double	80			CARDINAL	420	2023/24
7	Borang - Lapang**	Double	48			BEAR	250	2023/24
<b>Total</b>			<b>272</b>					
<b>B</b>	<b>220 kV Transmission Line</b>							
1	Marsayangdi - Kathmandu TL	Double	164	156.6		Twin Moose	500	2020/21
2	Kushma - New Butwal TL	Double	176			ACCC Drake	519.7	2021/22
3	New Butwal - Bardaghat TL	Double	42			BISON	350	2021/22
4	Dharapani - Khudi TL	Double	56			Moose	500	2022/23
5	Khudi - Udipur TL	Double	36			ACCC Drake	519.7	2021/22
6	Udipur - Bharatpur TL	Double	134			ACCC Drake	519.7	2022/23
7	Lapang - Ratmate TL**	Double	48			Twin Moose	500	2023/24
<b>Total</b>			<b>656</b>	<b>156.6</b>				
<b>C</b>	<b>400 kV Transmission Line</b>							
1	New Khimti - Barhabise	Double	92			MOOSE	500	2021/22
2	Barhabise - Kathmandu	Double	88			MOOSE	500	2021/22
<b>Total</b>			<b>180</b>					
(Note : ** - In the process of Procurement)								

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)
<b>I</b>	<b>Transmission Directorate</b>				
<b>A</b>	<b>400 kV Transmission Line</b>				
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	40.00	MOOSE	500
<b>Total</b>			<b>1090.00</b>		
<b>B</b>	<b>220 kV Transmission Line</b>				
1	Koshi Corridor (Inaruwa-Basantapur-Baneshwor-Tumlingtar)	Single	106	MOOSE	500
2	Koshi Corridor (Basantapur-Dhungesangu)	Single	35	MOOSE	500
3	Tumlingtar Sitalpati	Double	36.00	MOOSE	500
4	Trishuli 3B - Ratomate	Double	48.00	MOOSE	500
5	Lekhnath-Damauli	Double	90.00	MOOSE	500
6	Dhaubadi Iron Mine	Double	90.00	BISON	350
<b>Total</b>			<b>405.00</b>		
<b>C</b>	<b>132 kV Transmission Line</b>				
1	Dhalkebar- Balganga	Double	48.00	BEAR	250
2	Nawalpur (Lalbandi) Salimpur	Double	40.00	BEAR	250
3	Pathlaiya Harniya	Double	54.00	BEAR	250
4	Bhumahi-Hakui	Double	32.00	BEAR	250
5	Bajhang-Deepayal-Attariya	Double	260.00	BEAR	250
6	Bafikot-Madichaur (Khungri)	Double	150.00	BEAR	250
7	Surkhet-Dailekh	Double	64.00	BEAR	250
8	Kaligandaki- Ridi	Double	44.00	BEAR	250
9	Godak -Anarmani	Double	70.00	BEAR	250
10	Kabeli (Amarpur) Dhungesangu	Double	40.00	BEAR	250
11	Inaruwa Dharan	Double	50.00	BEAR	250
12	Godak Soyak	Double	16.00	BEAR	250
13	Rupani-Bodebarsain	Double	36.00	BEAR	250
14	Lahan Sukhipur	Double	34.00	BEAR	250
15	Chandrapur-Sukhdevchaur (Rajpur)	Double	70.00	BEAR	250



S.N.	Description	Type of Ckts	Length Circuit km	Conductor Type	Nominal Aluminium Cross Section Area (Sq.mm)
16	Barhabise Lamosaghu 2nd Circuit (Sunkoshi 132 kV SS)	Single	12.00	BEAR	250
<b>Total</b>			<b>1020.00</b>		
<b>II</b>	<b>Project Management Directorate</b>				
<b>A</b>	<b>400 kV Transmission Line</b>				
1	Nijgadh - Hetaunda	Double	150.00	MOOSE	500
2	New Butwal-Lamahi	Double	300.00	MOOSE	500
3	Lamahi-New Kohalpur	Double	180.00	MOOSE	500
4	New Kohalpur-Dododhara	Double	190.00	MOOSE	500
5	Dododhara(New Lamki)-New Attariya (Daiji)	Double	180.00	MOOSE	500
6	Tingla Hub-Likhu Hub- New Khimti	Double	110.00	MOOSE	500
7	New Khimti-Tamakoshi 3-Sunkoshi Hub-Dhalkebar	Double	220.00	MOOSE	500
8	Budhigandaki Corridor (Philim-Gumda-Ratamate)	Double	190.00	MOOSE	500
9	Damauli-Kusma-Burtibang-Bafikot	Double	400.00	MOOSE	500
<b>Total</b>			<b>1920.00</b>		
<b>B</b>	<b>132 kV Transmission Line</b>				
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
4	Chobhar - Lagankhel (UG)	Double	10.00	Single Core XLPE	500
5	Kohalpur - Nepalgunj	Double	20.00	BEAR	250
<b>Total</b>			<b>320.00</b>		

Table 4: Existing high voltage grid substations

S.N.	Substation	Voltage	Capacity FY 074-75	Capacity FY 075-76	Capacity FY 076-77	Capacity FY 077-78	Total Increment
		Ratio					
		kV	MVA	MVA	MVA	MVA	(MVA)
<b>A</b>	<b>Kathmandu Grid Division</b>						
1	Balaju	132/66	45	45	45	45	
		66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
		66/11		22.5	22.5	22.5	
2	Chapali	132/11	30	30	30	30	
		132/66	49.5	49.5	49.5	49.5	
		132/66	49.5	49.5	49.5	49.5	
3	Siuchatar	132/66	37.8	37.8	37.8	37.8	
		132/66	37.8	37.8	37.8	37.8	
		132/66	37.8	37.8	37.8	37.8	
		132/11			30	30	
		66/11	18	18	18	18	
		66/11	18	18	18	18	
4	New Chabel	66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
5	Lainchour	66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
6	New Patan	66/11	18	18	18	18	
		66/11	18	18	18	18	
		66/11	18	18	18	18	
		66/11	0	18	22.5	22.5	
7	Teku	66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
8	K3	66/11	22.5	22.5	22.5	22.5	
		66/11	22.5	22.5	22.5	22.5	
9	Baneshwor	66/11	18	18	18	30	12
		66/11	18	18	18	18	
10	Bhaktapur	132/66				49.5	49.5
		132/66	49.5	49.5	49.5	49.5	
		132/11	22.5	22.5	22.5	22.5	
		132/11			22.5	22.5	
		132/11	22.5	22.5	22.5	22.5	
11	Banepa	66/11	22.5	22.5	22.5	22.5	
		66/11	22.5				



S.N.	Substation	Voltage	Capacity FY 074-75	Capacity FY 075-76	Capacity FY 076-77	Capacity FY 077-78	Total Increment
		Ratio					
		kV	MVA	MVA	MVA	MVA	
12	Panchkhal	66/11	10	10	10	10	
13	Lamosanghu	132/33	30	30	30	30	
14	Matatirtha	132/33	30	30	30	30	
		132/11	22.5	22.5	22.5	22.5	
15	Indrawati	66/11	7.5	10	10	10	
16	Bagmati	66/11	0	0	6	6	
17	Samundratar	132/33				30	30
		132/33				30	30
		33/11				8	8
		33/11				8	8
B	Hetauda Grid Division						
18	Hetauda	132/66	45	45	45	45	
		132/66	45	45	45	45	
		66/11	10	10	10	10	
		66/11	10	10	10	10	
19	Kamane	132/33				63	63
		132/33	30	30	30	30	
		33/11	16.6	16.6	16.6	16.6	
20	Bharatpur	132/33	30	30	30	30	
		132/33	30	30	30	30	
		132/11	15	30	30	30	
		132/11	22.5	22.5	30	30	
21	Birgunj	66/33	12.5	12.5	30	30	
		66/33	12.5	12.5	12.5	12.5	
		66/11	30	30	30	30	
		66/11	30	30	30	30	
22	Parwanipur	132/11	22.5	22.5	22.5	22.5	
		132/11	22.5	22.5	22.5	22.5	
		132/11	22.5	22.5	22.5	22.5	
		132/66	63	63	63	63	
		132/66		63	63	63	
		132/66	63	0	0	63	63
23	Simra	66/11	15	15	15	15	
		66/11	15	15	15	15	
24	Amlekhgunj	66/11	7.5	7.5	7.5	7.5	
25	Pathlaiya	132/11	22.5	22.5	22.5	22.5	

S.N.	Substation	Voltage	Capacity FY 074-75	Capacity FY 075-76	Capacity FY 076-77	Capacity FY 077-78	Total Increment
		Ratio					
		kV	MVA	MVA	MVA	MVA	(MVA)
26	Purbi Chitwan	132/33			30	30	
		132/33			30	30	
		33/11			16.6	16.6	
<b>C</b>	<b>Dhalkebar Grid Branch</b>						
27	Lahan	132/33					
		132/33	63	63	63	63	
		33/11	16.6	16.6	16.6	16.6	
		33/11	16.6	16.6	16.6	16.6	
28	Chapur	132/33	30	30	30	30	
		132/33	30	30	30	30	
		33/11	8	8	16.6	16.6	
29	Dhalkebar	400/220				315	315
		400/220				315	315
		400/220				315	315
		220/132				315	315
		220/132				315	315
		220/132		160	160	160	
		220/132		160	160	160	
		132/33	30	30	30	30	
		132/33	63	63	63	63	
		33/11	8	8	16.6	16.6	
		33/11	16.6	16.6	16.6	16.6	
30	Mirchaiya	132/33	30	30	30	30	
		33/11	8	16.6	16.6	16.6	
31	Rupani	132/33		63	63	63	
32	Tingla	132/33			30	30	
		33/11			8	8	
<b>D</b>	<b>Duhabi Grid Branch</b>						
33	Duhabi	132/33	63	63	63	63	
		132/33	63	63	63	63	
		132/33	63	63	63	63	
		33/11	16.6	16.6	16.6	16.6	
		33/11	16.6	16.6	16.6	16.6	
34	Anarmani	132/33	30	30	30	30	
		132/33	30	30	30	30	
		33/11	16.6	16.6	16.6	16.6	
		33/11	8	16.6	16.6	16.6	



S.N.	Substation	Voltage	Capacity FY 074-75	Capacity FY 075-76	Capacity FY 076-77	Capacity FY 077-78	Total Increment
		Ratio					
		kV	MVA	MVA	MVA	MVA	(MVA)
35	Damak	132/33	30	30	63	63	
		33/11	16.6	16.6	16.6	16.6	
36	Godak	132/33	30	63	63	63	
		33/11	8	8	8	8	
37	Phidim	132/33		20	20	20	
		33/11		3	3	3	
38	Amarpur (Kabeli)	132/33		30	30	30	
		33/11		3	3	3	
<b>E</b>	<b>Butwal Grid Division</b>						
39	Butwal	132/33	63	63	63	63	
		132/33	63	63	63	63	
		132/33	63	63	63	63	
		33/11	16.6	16.6	16.6	16.6	
		33/11	16.6	16.6	16.6	16.6	
		33/11	0.0	16.6	16.6	16.6	
40	Bardghat	132/11	22.5	22.5	22.5	22.5	
		132/11	7.5	7.5	22.5	22.5	
41	Chanauta	132/33	30	30	30	30	
		132/33	12.5	12.5	30	30	
		33/11	3	8	8	8	
		33/11	3	3	8	8	
42	Lamahi	132/33	63	63	63	63	
		132/33	30	30	30	30	
		33/11	16.6	16.6	16.6	16.6	
		33/11			8	8	
43	Ghorahi	132/33		30	30	30	
		33/11		0	0	16.6	16.6
44	Kawasoti	132/33				30	30
		132/33	30	30	30	30	
		33/11	16.6	16.6	16.6	16.6	
45	Gandak	132/33			30	30	
<b>F</b>	<b>Pokhara Grid Branch</b>						
46	Damauli	132/33	30	30	30	30	
		132/33	30	30	30	30	
		33/11	16.6	16.6	16.6	16.6	
		33/11	3	3	3	3	

S.N.	Substation	Voltage	Capacity FY 074-75	Capacity FY 075-76	Capacity FY 076-77	Capacity FY 077-78	Total Increment
		Ratio					
		kV	MVA	MVA	MVA	MVA	
47	Pokhara	132/11	30	30	30	30	
		132/11	30	30	30	30	
48	Lekhnath	132/33	12.5	30	30	30	
		132/11			22.5	22.5	
		132/11	22.5	22.5	22.5	22.5	
49	Markichowk	132/33		30	30	30	
50	Syangja	132/33	30	30	30	30	
		33/11	8	8	8	8	
51	Dana	220/132				100	100
		132/33				25	25
52	Kushma	220/132				100	100
<b>G</b>	<b>Attaria Grid Branch</b>						
53	Kusum	132/11	12.5	12.5	12.5	12.5	
54	Hapure	132/33		30	30	30	
		33/11		8	8	8	
55	Attaria	132/33	30.0	30.0	30.0	30.0	
		132/33	30.0	30.0	30.0	30.0	
		33/11	16.6	16.6	16.6	16.6	
56	Kohalpur	132/33	30	63	63	63	
		132/33	30	30	30	30	
		33/11	3	3	16.6	16.6	
		33/11	16.6	16.6	16.6	16.6	
57	Lamki	132/33	15	15	15	15	
		132/33	15	15	15	15	
		33/11	16.6	16.6	16.6	16.6	
58	Mahendranagar	132/33	15	15	15	30	15
		132/33	10	15	15	15	
		33/11	7.5	7.5	7.5	16.6	9.1
59	Bhurigaon	132/33	30	30	30	30	
		33/11	8	8	8	8	
60	Pahalmanpur	132/33	30	30	30	30	
		33/11	8	8	8	8	
61	Syaule	132/33		30	30	30	
		33/11		8	8	8	

S.N.	Voltage Rating (kV)	Transformer No.	Total Capacity FY 74-75 (MVA)	Total Capacity FY 75-76 (MVA)	Total Capacity FY 76-77 (MVA)	Total Capacity FY 77-78 (MVA)	Total Increment (MVA)
1	400/220	3				945	945
2	220/132	6		320	320	1150	830
3	132/66	13	522.90	522.90	522.90	635.40	112.5
4	132/33	55	1397.00	1718.50	1889.00	2082.00	193
5	132/11	19	350.00	365.00	462.50	462.50	0
6	66/33	2	25.00	25.00	42.50	42.50	0
7	66/11	32	553.50	574.00	584.50	596.50	12
8	33/11	38	349.1	409.9	478.3	520.0	41.7
<b>Total</b>		<b>168</b>	<b>3197.50</b>	<b>3935.30</b>	<b>4299.70</b>	<b>6433.90</b>	<b>2134.20</b>

Table 5: Under construction high voltage grid substations

S.N.	Name of Project	Substation	Voltage Level (Ratio)	Capacity	Total Capacity	Expected Completion Year
			kV	MVA	MVA	AD
I	Transmission Directorate					
1	Chilime Trishuli 220 kV Transmission Line	Chilime	220/132 132/33	1 Ø, 7x53.33 Bank 3 Ø, 50	370	2021/22
2	Trishuli 3B Hub Substation	Trishuli 3 B Hub	220/132 132/33	1 Ø, 7x53.33 Bank 3 Ø, 50	370	2021/22
3	Hetauda- Bharatpur220 kV Transmission Line	New Bharatpur (Aaptari)	132/33	3 Ø, 22.5	22.5	2021/22
4	Singati Lamosanghu 132 kV Transmission Line	Singati	132/33	3 Ø, 30	30	2021/22
5	Ramechhap Garjyang Khimti 132 kV Transmission Line	Garjyang	132/33	1 Ø, 4x10 Bank	30	2021/22
6	Kushaha Kataiya 132 kV Second Circuit Transmission Line	Kushaha	132/11	3 Ø, 22.5	22.5	2021/22
7	Dordi Corridor132 kV Transmission Line	Kritipur	132/11	3 Ø, 10	10	2021/22
8	Butwal Lumbini132 kV Transmission Line	Mainahiya	132/33 33/11	3 Ø, 2x45 3 Ø, 16	106	2021/22
9	Koshi Corridor 220 kV Transmission Line	Tumlingtar	220/132 132/33	1 Ø, 7x33.33 Bank 3 Ø, 2x30	260	2021/22
		Baneshwor	220/33	3 Ø, 2x30	60	2021/22
		Basantapur	220/132 132/33	1 Ø 7x33.33 Bank 3 Ø, 30	230	2021/22
10	Ramechhap Garjyang Khimti 132 kV Transmission Line	New Khimti	220/132	1 Ø, 4x66.67 Bank	200	2021/22
11	Burtibang Paudi Amarai Tamghas Sandhikharka Gorusinghe 132 kV Transmission Line	Burtibang	132/33	3 Ø, 30	30	2021/22
		Paudi Amarai	132/33	3 Ø, 30	30	2021/22
		Tamghas	132/33	3 Ø, 30	30	2021/22
		Sandhikharka	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2021/22
		Motipur	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2021/22

12	Kushaha Biratnagar 132 kV Transmission Line	Biratnagar	132/33 33/11	3 Ø, 2x63 3 Ø, 16	142	2021/22
13	Nawalpur 132 kV Substation	Nawalpur	132/33 33/11	3 Ø, 63 3 Ø, 16	79	2021/22
14	Sunwal 132 kV Substation	Sunwal	132/33 132/11	3 Ø, 2x63 3 Ø, 22.5	148.5	2021/22
15	Hetauda- Dhalkebar-Inaruwa 400 kV Substation Expansion Project	Hetauda	400/220	1 Ø, 4x167 Bank	500	2021/22
		Inaruwa	400/220	3 Ø, 3x315	945	2021/22
16	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	2021/22
		Inaruwa	220/132 220/33	3 Ø, 2x100 3 Ø, 2x63	326	2021/22
17	Koshi Corridor 220 kV Transmission Line	Dhangesanghu	132/33	1 Ø, 7x5 Bank	30	2021/22
18	New Modi Lekhnath 132 kV Transmission Line	Lahachowk	132/33 33/11	3 Ø, 30 3 Ø, 8	38	2021/22
19	Lamahi Ghorahi 132 kV Substation Expansion	Ghorahi	132/33	3 Ø, 63	63	2021/22
20	Dhalkebar Loharpatti 132 kV Transmission Line	Loharpatti	132/33 132/11 33/11	3 Ø, 2x30 3 Ø, 22.5 3 Ø, 16	98.5	2022/23
Total					4,457.00	
II	Under Project Management Directorate					
1	New Butwal 220 kV Transmission Line & Substation Project	New Butwal	220/132	1 Ø, 4x33.33	100	2020/21
2	220 kV Bahrabise Substation	Barhabise	220/132	1 Ø, 4x53.33	165	2021/22
			132/11	3 Ø, 1x5		
3	Kathmandu Valley Transmission Capacity Reinforcement Project	Chobhar	132/11	3 Ø, 2x45	90	2021/22
		Futung	132/11	3 Ø, 2x45	90	2021/22
		Thimi	132/11	3 Ø, 2x45	90	2021/22
4	Marsyangdi-Kathmandu 220 kV TL Project	Markichowk	220/132	1 Ø, 7x53.33	320	2022/23
		Matatirtha	220/132	1 Ø, 7x53.33	320	2022/23
5	Marsyangdi Corridor 220 kV TL Project	Bharatpur	220/132	3 Ø, 2x160	320	2022/23
		Udipur	220/132	1 Ø, 4x53.33	210	2022/23
			132/33	3 Ø, 1x50		
		Khudi	220/132	1 Ø, 4x53.33	210	2022/23
			132/33	3 Ø, 1x50		
		Dharapani	132/33	1 Ø, 4x33.33	130	2022/23
			132/33	3 Ø, 1x30		
6	Lapsipedi and Changunarayan SS Project	Lapsipedi	220/132	1 Ø, 4x53.33	182.5	2022/23
			132/11	3 Ø, 1x22.5		
		Changunarayan	132/11	3 Ø, 1x45	45	



7	New Khimti - Barhabise - Lapsiphedi 400 kV SS Project	New Khimti	400/220	1 Ø, 7x105	630	2022/23
		Barhabise	400/220	1 Ø, 7x53.33	320	2022/23
		Lapsiphedi	400/220	1 Ø, 4x105	315	2022/23
8	Parwanipur - Pokhariya 132 kV TL Project**	Pokhariya	132/33	3 Ø, 2x63	171	2023/24
			132/11	3 Ø, 1x45		
9	Kathmandu Valley Transmission Capacity Reinforcement Project (Phase II)**	Thimi	132/11	3 Ø, 2x45	90	2022/23
		Koteshwor	132/66	3 Ø, 2x63	216	
			132/11	3 Ø, 2x45		
10	Borang-Lapang 132 kV and Lapang-Ratmate 220 kV Transmission Line and Substation project **	Borang	132/33	3 Ø, 30	30	2023/24
		Lapang	220/132 132/33	1 Ø, 7x33.33 3 Ø, 30	230	
11	Ghorahi Madichaur 132 kV Transmission Line **	Madichaur	132/33	3 Ø, 30	30	2023/24
12	Dadakhhet Rahughat132 kV Transmission Line **	Dadakhhet	132/33	3 Ø, 30	30	2023/24
		Rahughat	220/132 132/33	1 Ø, 7x33.33 3 Ø, 30	230	
13	132 kV Pangtang Substation **	Pangtang	132/33	3 Ø, 30	30	2023/24
14	132 kV Keraun substation **	Keraun	132/33	3 Ø, 2x63	148.5	2023/24
			132/11	3 Ø, 22.5		
Total					4743	
** Under procurement process						

Table 6: Planned and proposed construction high voltage grid substations

S.N.	Name of Project	Substation	Voltage Level (Ratio)	Capacity	Total Capacity
			kV	MVA	MVA
I	Transmission Directorate				
1	Bheri Corridor 400 kV Transmission Line	Bafikot	400/132	1 Ø, 7x33.33 Bank	200
2	Lekhnath Damauli 220 kV Transmission Line	Lekhnath	220/132	1 Ø, 7x100 Bank	600
		Damauli	220/132	3 Ø, 63	63
			132/11	3 Ø, 20	20
3	Tumlingtar Sitalpati 220 kV Transmission Line	Sitalpati	220/132 132/33	1 Ø, 7x33.33 Bank 1 Ø, 4x8 Bank	224
4	Dharan 220/33 kV substation	Dharan	220/33 33/11	3 Ø, 63 3 Ø, 10	73
5	Dhaubadi Iron Mine 220 kV Transmission Line	Dhaubadi	220/132	3 Ø, 2x 100	200
6	Balefi Barhabise 132 kV Transmission Line	Pangtang (Balefi)	132/33	3 Ø, 63	63
7	Kaligandaki Ridi132 kV Transmission Line	Ridi	132/33 33/11	3 Ø, 30 3 Ø, 8	38
8	Lalbandi Salimpur 132 kV Transmission Line	Salimpur	132/33	3 Ø, 63	63
9	Dhalkebar Balganga 132 kV Transmission Line	Balganga	132/33	3 Ø, 2x63	126
10	Bhumahi Hakui132 kV Transmission Line	Hakui	132/33	3 Ø, 63	63
11	Godak Anarmani 132 kV Transmission Line	Anarmani	132/33	3 Ø, 63	63
12	Pathalaiya Harniya 132 kV Transmission Line	Harniya	132/33	3 Ø, 63	63
13	New Pokhara 132 kV Substation	Birauta	132/11	3 Ø, 30	30
14	Lahan - Sukhipur 132 kV Transmission Line	Sukhipur	132/33	3 Ø,2x30	60
15	Rupani - Bodebarsain 132 kV Transmission Line	Bodebarsain	132/33	3 Ø,2x30	60
16	Chandrapur - Sukhdevchaur 132 kV Transmission Line	Sukhdevchaur	132/33	3 Ø,2x63 3 Ø,25	151
Total					2160
I	Project Managment Directorate				
1	Kohalpur - Nepalgunj 132 kV Transmission Line	Nepalgunj	132/33	3 Ø, 2x63	126
2	Arun Khola (Dumkibas) 132 kV Substation	Dumkibas	132/33/11	3 Ø, 2x30	60
3	Mulpani Substation	Mulpani	132/11	3 Ø, 2x45	90



S.N.	Name of Project	Substation	Voltage Level (Ratio)	Capacity	Total Capacity
			kV	MVA	MVA
4	New Butwal - Lamahi - Kohalpur - New Lamki - New Attariya 400 kV Transmission Line	Lamahi	400/220/132	630	720
			132/11	90	
		New Kohalpur	400/220/132	630	720
			132/11	90	
		New Attariya	400/220/132	630	720
			132/11	90	
5	Tingla Hub-Likhu Hub- New Khimti 400 kV Transmission Line	Likhu Hub	400/220/132	630	630
6	New Khimti-Tamakoshi 3-Sunkoshi Hub-Dhalkebar 400 kV Transmission Line	Sunkoshi Hub	400/220/132	630	630
7	Budhigandaki corridor 400 kV Transmission Line	Phelim / Gumda	400/220/132	630	
8	Dailekh - Kalikot - Jumla 132 kV Transmission Line	Kalikot	132/33	63	108
			132/11	45	
		Jumla	132/33	63	108
			132/11	45	
9	Damauli - Kushma - Burtibang - Banfikot 400 kV Transmission Line	Kushma	400/220/132	630	630
		Burtibang	400/220/132	630	630
		Banfikot	400/220/132	630	630
10	Lamosangu - Kavre / Ramechhap 132 kV Transmission Line	Kavre/ Ramechhap	132/33	63	108
			132/11	45	
Total					5910

**Table 7: Major completed upgradation and reinforcement works of grid substations in FY 2077/078**

S.N.	Substation	Voltage Ratio kV	Previous Capacity MVA	New Capacity MVA	Remarks
1	Dhalkebar	220/132	320	950	A new 2x315MVA transformers with associated bays were added.
2	Kamane	132/33	30	93	A new 63MVA transformer with associated bay was added.
3	Kawasoti	132/33	30	60	A new 30MVA transformer with associated bay was added.
4	Parwanipur	132/66	126	189	A new 63MVA transformer with associated bay was added.
5	Bhaktapur	132/66	49.5	99	A new 49.5MVA transformer with associated bay was added.
6	Baneshwor	66/11	36	48	18 MVA was replaced by new 30MVA.
7	Devighat	66/11	10	30	10MVA was replaced by new 30MVA.
8	Mahendranagar	132/33	30	45	15MVA was replaced by new 30MVA
9	Ghorahi	33/11	0	16.6	A new 16.6MVA transformer with associated bay was added.
10	Mahendranagar	33/11	7.5	16.6	7.5MVA was replaced by new 16.6MVA.
<b>Capacitor Banks</b>					
11	Bardaghat	Installation of 11kV, 2x5MVAR Capacitor Bank at Bardaghat S/S			
12	Chanauta	Installation of 33kV, 12.5MVAR Capacitor Bank at Chanauta S/S			
13	Lamahi	Installation of 33kV, 2x12.5MVAR Capacitor Bank at Lamahi S/S			
14	Kohalpur	Installation of 33kV, 12.5MVAR Capacitor Bank at Kohalpur S/S			
15	Lamki	Installation of 33kV, 12.5MVAR Capacitor Bank at Lamki S/S			
16	Attaria	Installation of 33kV, 12.5MVAR Capacitor Bank at Attaria S/S			
17	Mahendranagar	Installation of 33kV, 12.5MVAR Capacitor Bank at Mahendranagar S/S			

**Total Transformer Capacity Increment in F/Y 2077/078 : 908.2MVA**
**Total Capacitor Bank Capacity Increment in F/Y 2077/078: 97.5MVAR**
**Table 8: Major ongoing upgradation and reinforcement works of grid substations**

S.N.	Substation	Voltage Ratio kV	Existing Capacity MVA	New Capacity MVA	Remarks
1	Bharatpur	132/11	60	82.5	New 22.5MVA to be installed in the spare Bay.
2	Parwanipur	132/11	67.5	90	A new 22.5MVA transformer with associated Bay.
3	Baneshwor	66/11	48	60	18 MVA to be replaced by new 30MVA.
4	Dhalkebar	132/33	93	126	30MVA to be replaced by new 63MVA
5	Hetauda	66/11	20	60	2x10MVA to be replaced by new 2*30MVA
6	Pathlaiya	132/33	0	30	30MVA transformer with associated bay



S.N.	Substation	Voltage Ratio kV	Existing Capacity MVA	New Capacity MVA	Remarks
7	Damak	132/33	63	126	A new 63MVA to be installed in the spare Bay
8	Kohalpur	132/33	93	126	30MVA to be replaced by new 63MVA
9	Chanauta	33/11	16	24.6	8MVA to be replaced by new 16.6MVA
10	Duhabi	132/33	189	345	3x63MVA to be replaced by new 3x105MVA and 30MVA transformer with associated bay
11	Butwal	132/33	189	315	3x63MVA to be replaced by new 3x105MVA
12	Anarmani	132/33	60	126	2x30MVA to be replaced by new 2x63MVA
13	Anarmani	33/11	33.2	48	2x16.6MVA to be replaced by new 2x24MVA
14	Duhabi	33/11	33.2	48	2x16.6MVA to be replaced by new 2x24MVA
15	Chapur	132/33	60	93	30MVA to be replaced by new 63MVA
16	Lamosanghu	132/33	30	63	30MVA to be replaced by new 63MVA
17	Chabahil	66/11	67.5	90	A new 22.5MVA transformer with associated Bay.
18	Chapali	132/11	30	60	30MVA Transformer with associated Bay.
19	Attaria	132/33	60	126	2x30MVA to be replaced by new 2x63MVA
20	Attaria	33/11	16.6	33.2	A new 16.6MVA transformer with associated Bay.
21	Lamahi	132/33	93	126	30MVA to be replaced by new 63MVA
22	Matatirtha	132/11	22.5	45	A new 22.5MVA transformer with associated Bay.
23	Parwanipur	132/33	0	63	A new 63MVA transformer with associated Bay.
24	Damak	33/11	16.6	33.2	A new 16.6MVA transformer with associated Bay.
25	Bagmati	66/33	0	10	10MVA transformer with associated Bay.
<b>Capacitor Banks</b>					
26	Duhabi	Installation of 33kV, 12.5MVA Capacitor Bank at Duhabi S/S			
27	Gandak	Installation of 33kV, 2x12.5MVA Capacitor Bank at Gandak S/S			
28	Rupani	Installation of 33kV, 12.5MVA Capacitor Bank at Rupani S/S			
29	Bharatpur	Installation of 33kV, 12.5MVA Capacitor Bank at Bharatpur S/S			

**Total Transformer Capacity Increment under progress : 958.4MVA**

**Total Capacitor Bank Capacity Increment under progress : 62.5MVA**

Table 9: Major upgradation and reinforcement works of grid substations under Plan

S.N.	Substation	Voltage Ratio kV	Existing Capacity MVA	New Capacity MVA	Remarks
1	Chapur	132/33	93	126	30MVA to be replaced by new 63MVA
2	Singati	132/33	0	30	30MVA to be installed in Singati
3	Balaju	132/11	0	90	New 2x45MVA transformer with associated bays
4	Gandak	132/33	30	60	30MVA Transformer with associated Bay.
5	Hetauda	132/66	90	135	A New 45MVA Transformer with associated Bay.
6	Simara	66/11	30	45	15MVA Transformer with associated Bay.
7	Mahendranagar	132/33	45	60	15MVA to be replaced by new 30MVA
8	Lahan	132/33	63	93	30MVA Transformer to be installed in spare Bay.
9	Mirchaiya	132/33	30	60	A New 30MVA Transformer with associated Bay.
10	Chanauta	132/33	60	93	30MVA to be replaced by new 63MVA
<b>Capacitor Banks</b>					
11	Hetauda	Installation of 66kV 20MVar Capacitor Bank at Hetauda S/S			
12	Simara	Installation of 66kV 20MVar Capacitor Bank at Simara S/S			
13	Dhalkebar	Installation of 33kV 12.5MVar Capacitor Bank at Dhalkebar S/S			
14	Lahan	Installation of 33kV 12.5MVar Capacitor Bank at Lahan S/S			
15	Mirchaiya	Installation of 33kV 12.5MVar Capacitor Bank at Mirchaiya S/S			
16	Kawasoti	Installation of 33kV 12.5MVar Capacitor Bank at Kawasoti S/S			

**Total Transformer Capacity Increment under plan : 351MVA**

**Total Capacitor Bank Capacity Increment under plan : 90MVar**

Table 10: 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	0
2	Director	11	Technical	-	5	4
3	Joint Director	10	Administration	Administration	1	0
4	Joint Director	10	Administration	Finance	1	0
5	Manager	10	Technical	Electrical	7	3
6	Deputy Director	9	Administration	Finance	0	1
7	Deputy Director	9	Administration	Administration	0	1
8	Deputy Manager	9	Technical	Electrical	9	6
9	Deputy Manager	9	Technical	Electronic	1	1
10	Deputy Manager	9	Technical	Civil	1	0
11	Assistant Director	8	Administration	Administration	1	0
12	Assistant Director	8	Administration	Finance	1	0
13	Assistant Manager	8	Technical	Electrical	19	12
14	Assistant Manager	8	Technical	Electronic	3	3



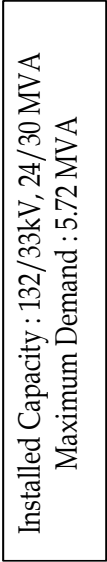
S.N.	Position	Level	Service	Group	Approved Position	Working Employee
15	Assistant Manager	8	Technical	Mechanical	1	1
16	Assistant Manager	8	Technical	Civil	3	1
17	Administration Officer	7	Administration	Administration	6	2
18	Finance Officer	7	Administration	Finance	4	3
19	Engineer	7	Technical	Electrical	46	42
20	Engineer	7	Technical	Electronic	4	3
21	Engineer	7	Technical	Civil	21	7
22	Survey Officer	7	Technical	Survey	2	1
23	Assistant Administration Officer	6	Administration	Administration	4	7
24	Assistant Finance Officer	6	Administration	Finance	4	6
25	Assistant Computer Officer	6	Administration	Computer	0	3
26	Assistant Engineer	6	Technical	Electrical	39	28
27	Assistant Engineer	6	Technical	Civil	3	1
28	Senior Assistant (Mi.Ri. Su.Bha)	5	Administration	Administration	10	12
29	Accountant/ Store Keeper	5	Administration	Finance	10	9
30	Computer Operator	5	Administration	Administration	2	0
31	Supervisor	5	Technical	Electrical	128	116
32	Supervisor	5	Technical	Mechanical	2	1
33	Supervisor (Draft Man)	5	Technical	Civil	7	4
34	Senior Communication Equipment Operator	5	Technical	Electronic	1	1
35	Senior Heavy Equipment Operator	5	Technical	Vechical Driver	6	7
36	Office Assistant/ Si. Mi.Ri.	4	Administration	Administration	5	6
37	Assistant Accountant / Assistant Store Keeper	4	Administration	Finance	10	11
38	Foreman	4	Technical	Electrical	58	90
39	Foreman	4	Technical	Mechanical	2	1
40	Foreman Driver	4	Technical	Vechical Driver	13	10
41	Clerk ( Mi. Ri)	3	Administration	Administration	1	1
42	Electrician	3	Technical	electrical	176	128
43	Driver	3	Technical	Vechical Driver	13	13
44	Office Helper -2	2	Administration	Administration	32	18
45	Helper	2	Technical	Electrical	88	44
46	Office Helper -1	1	Administration	Administration	24	11
47	Junior Helper	1	Technical	Electrical	18	17
<b>Total</b>					<b>793</b>	<b>636</b>

## 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
4	Damak
5	Anarmani
6	Duhabi
7	Kushaha 132 kV Switching Station
8	Rupani
9	Lahan
10	Mirchaiya
11	Tingla
12	Dhalkebar 220/132 kV
13	Chandranigahapur
14	Pathlaiya
15	New Parwanipur
16	Birgunj
17	Simra
18	Amlekhgunj
19	Kamane
20	Hetauda
21	Bharatpur
22	Purbi Chitwan
23	Balaju
24	Chapali
25	Siuchatar
26	New Chabel
27	Lainchour
28	New Patan
29	Teku

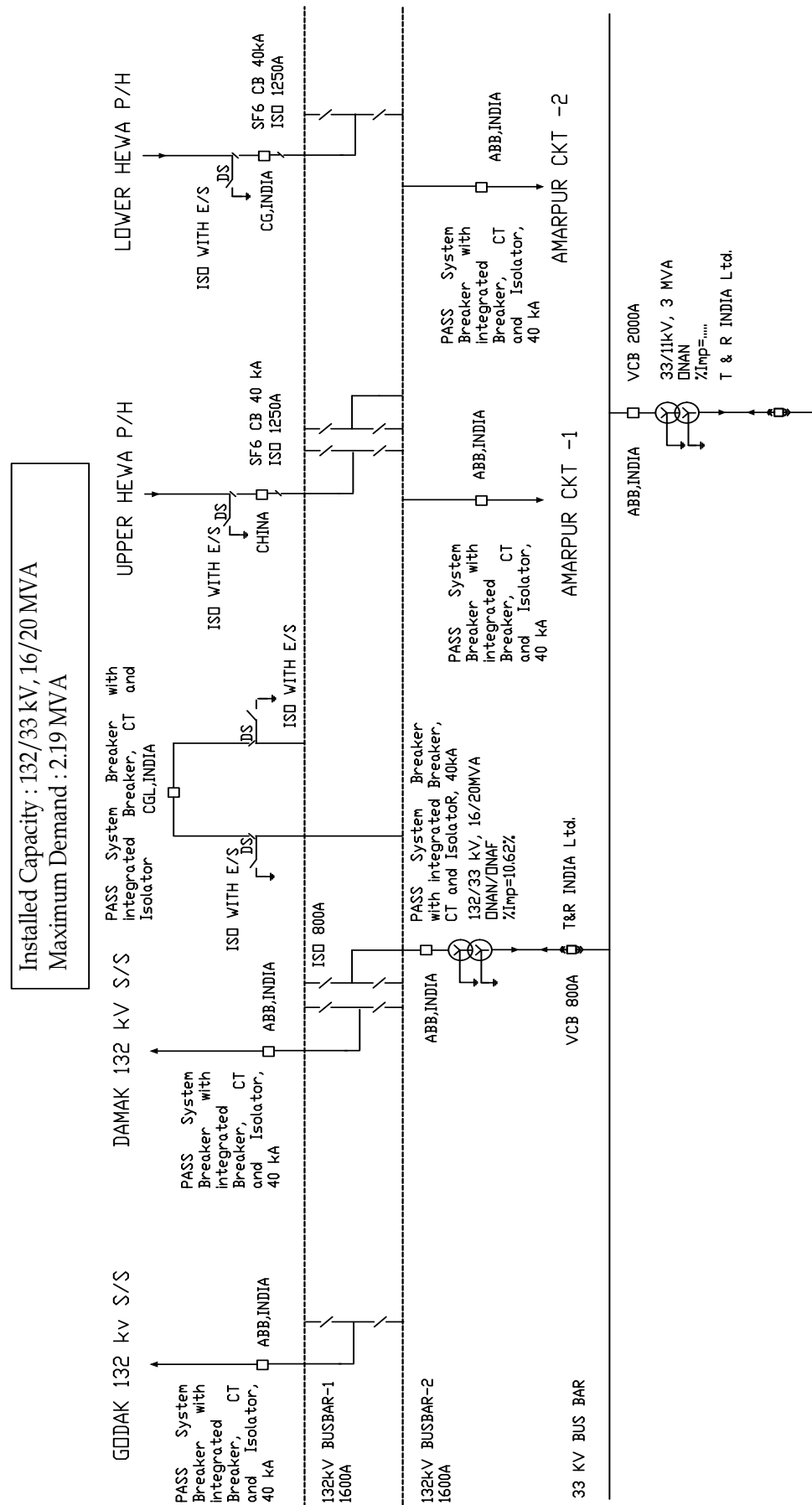
S.N.	Name of Substation
30	K3
31	Baneswor
32	Bhaktapur
33	Banepa
34	Panchkhal
35	Lamosanghu
36	Matatirtha
37	Indrawati
38	Damauli
39	Pokhara
40	Lekhnath
41	Markichowk
42	Syangja
43	Butwal
44	Bardghat
45	Gandak 132 kV Switching Station
46	Chanauta
47	Lamahi
48	Ghorahi
49	Kawasoti
50	Kusum
51	Hapure
52	Attaria
53	Kohalpur
54	Lamki
55	Mahendranagar
56	Bhurigaon
57	Pahalmanpur
58	Syaule
59	Samundratar

Amarpur substation with Double Bus bar system, located at Amarpur of Panchthar district of Mechi Zone and connected to Thapatar 132 kV Sub 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.

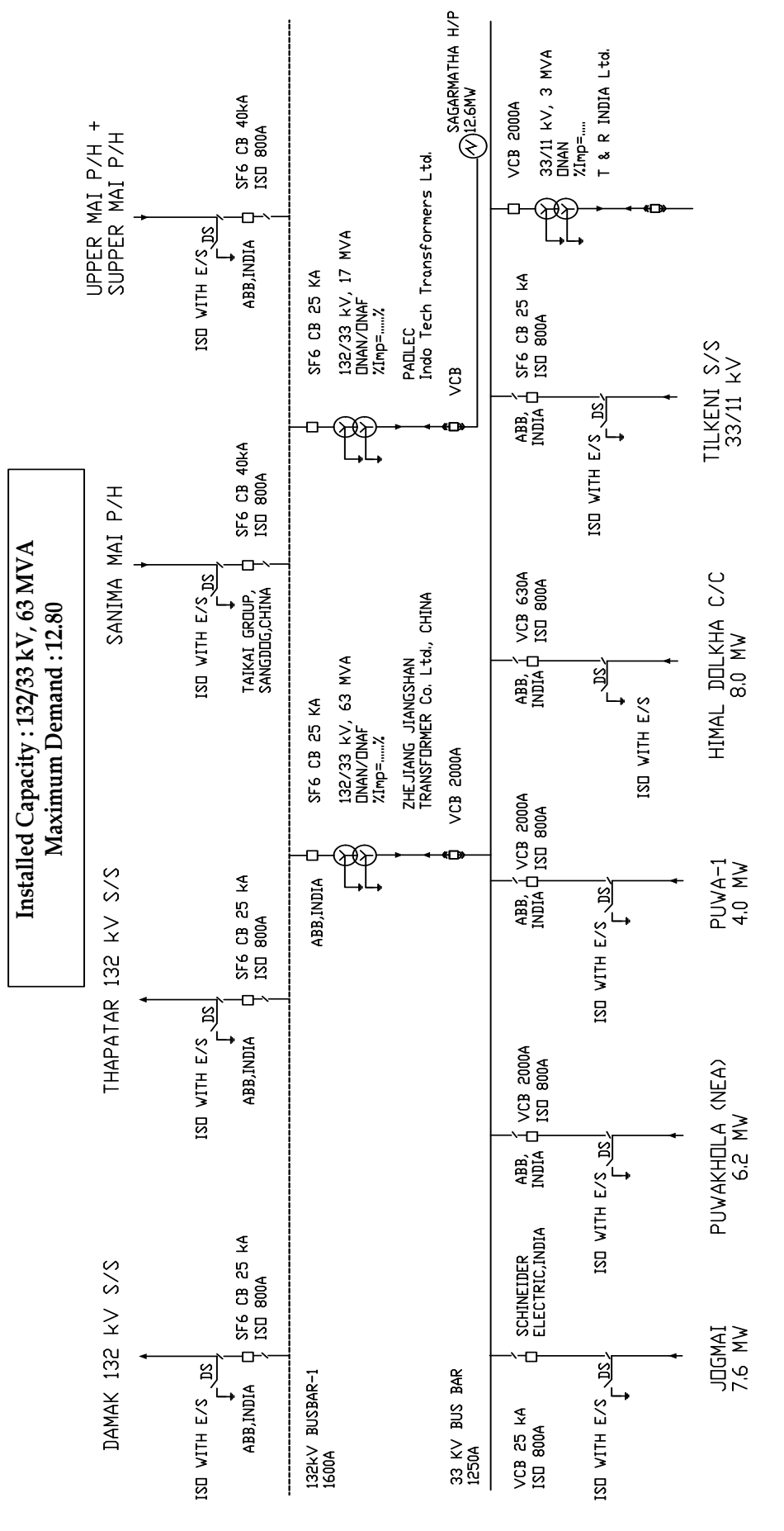


## 2. PHIDIM (THAPATAR) SUBSTATION

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 Amarapur 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.



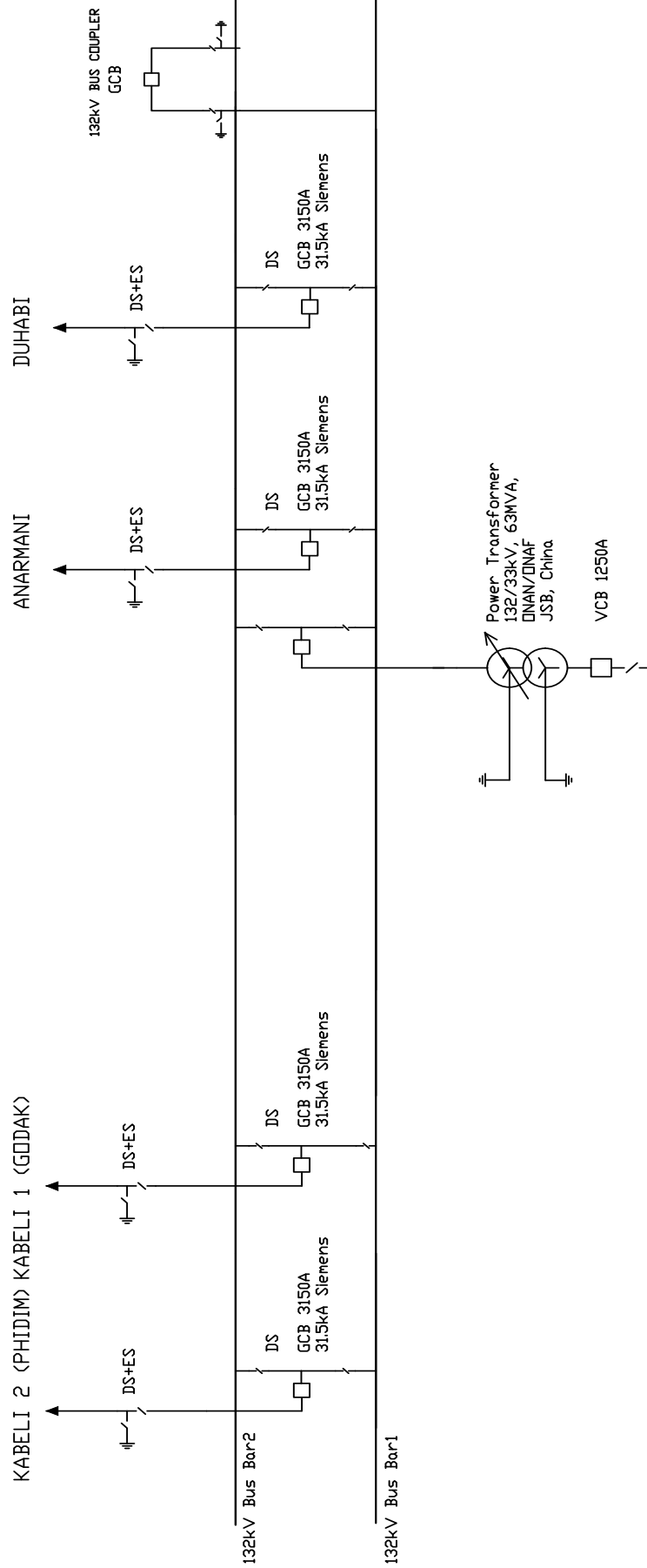
Godak substation with Single Bus bar system, located at Godak of Ilam district of Mechi Zone and connected to Damak and Thapatar 132 kV Sub Stations. This substation is receives power from Sanima Mai (30MW), Upper Mai (18.1MW), Supper Mai(7.8MW) by 132 kV single circuit line and Himal Dolkha C/C (8MW), 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, 30MVA 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 Saktim local feeder.



## 4. DAMAK SUBSTATION

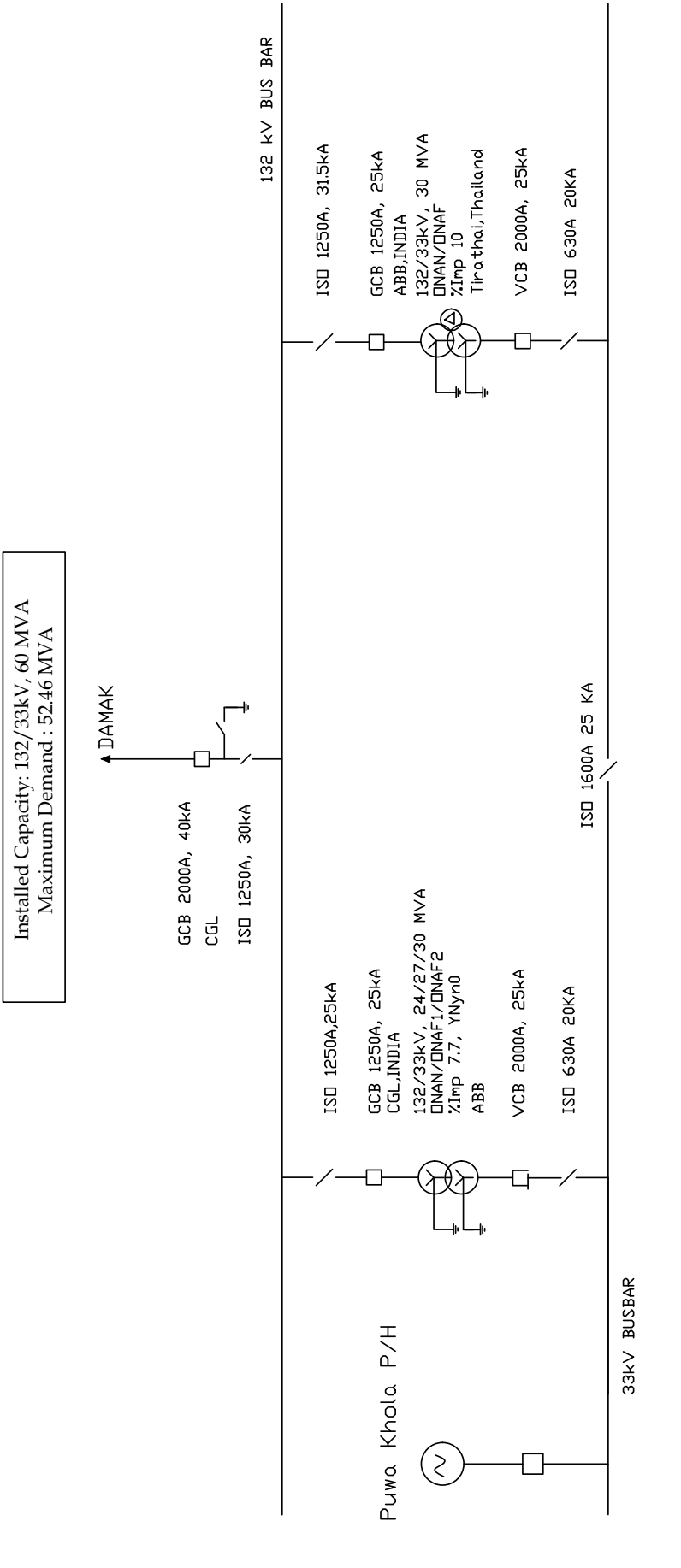
Damak substation located at Damak of Jhapa District, Mechi Zone, feeds power to Damak, Panchgachi, Kerkha and Padajungi area. This Substation is connected to Duhabi and Anarmani by 132 kV single circuit line and Kabeli Corridor through double circuit line. This Substation was commissioned in 2015 with 132/33kV, 30MVA capacity. New 132/33kV, 63MVA Transformer Bay was installed in 2020 and 30MVA was put out of service.

Installed Capacity : 132/33kV, 63MVA  
Maximum Demand : 31.32MVA



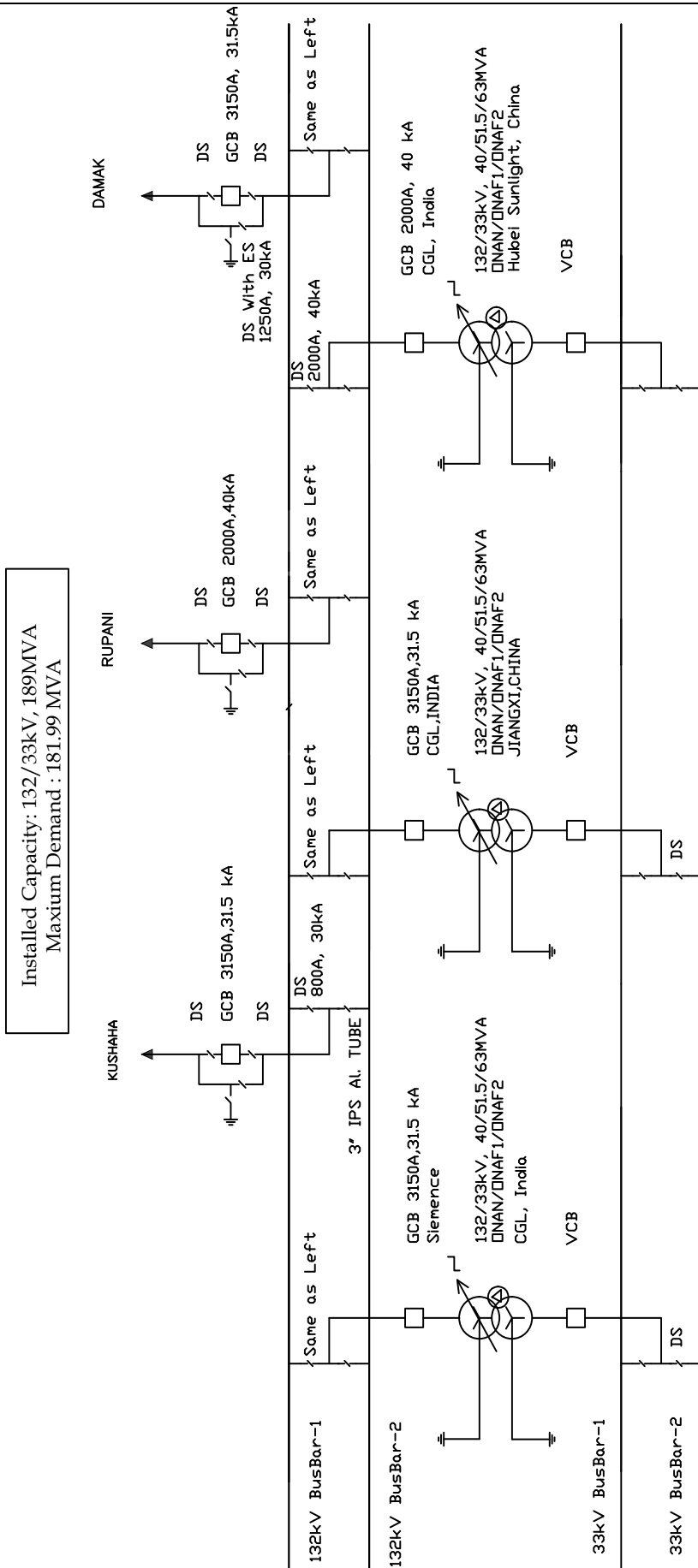
## 5. ANARMANI SUBSTATION

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.



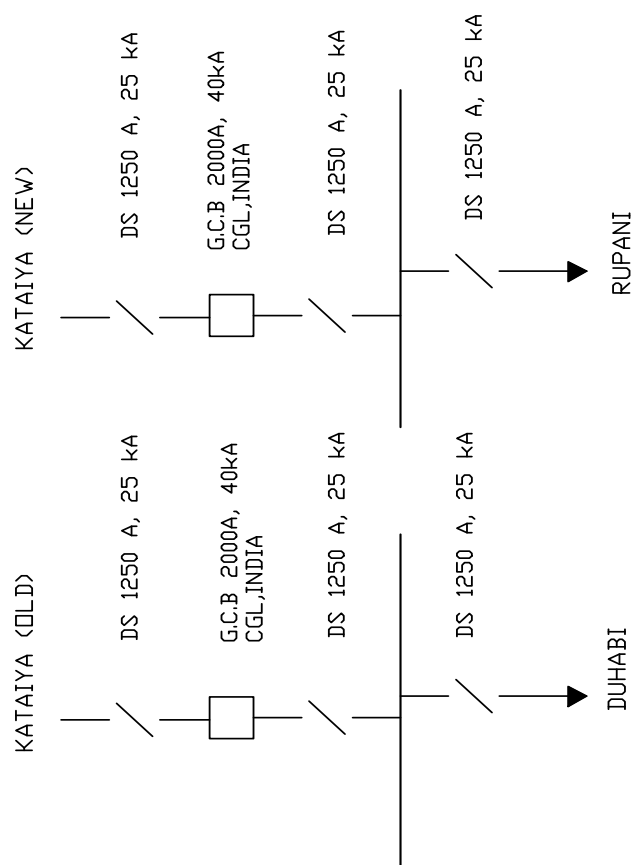
## 6. DUHABI SUBSTATION

Duhabi substation with double bus system, 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

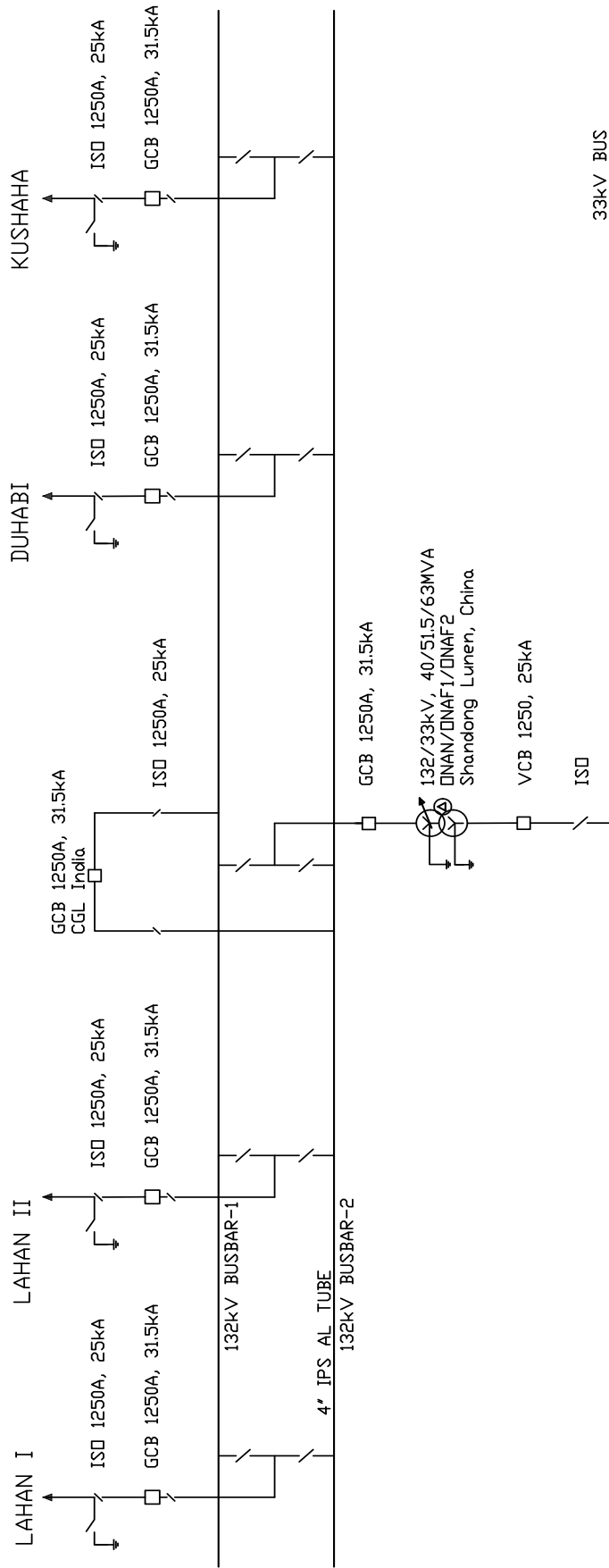
Kusaha switching station located at kushaha of Sunsari district of Koshi Zone was constructed to import the power from Kataiya, India. This switching station is connected to Lahan and Duhabi substations 132kV line, to evacuate the imported power to the eastern region. It was built in 1999 without Circuit 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.

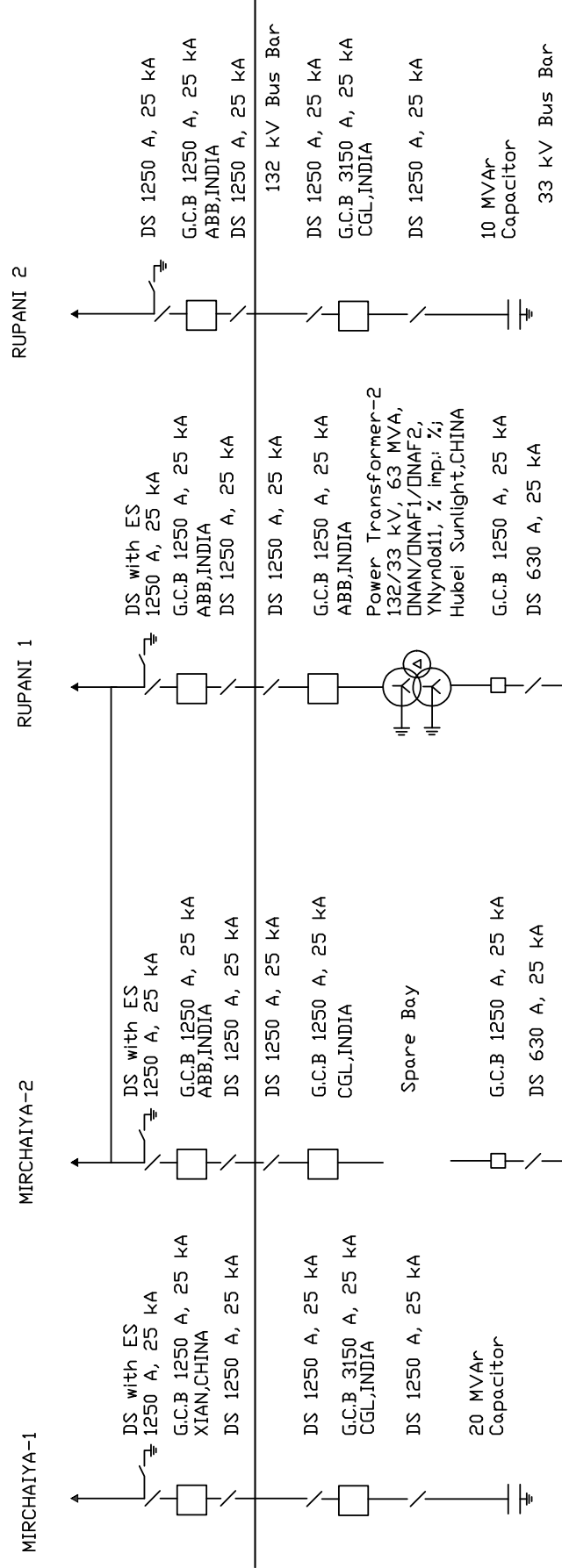
Installed Capacity : 132/33kV, 63MVA  
Maximum Demand : 27.89MVA



## 9. LAHAN SUBSTATION

Lahan Substation with single busbar system, located at Lahan of Siraha district of Sagarmatha zone feeds power to Rajbiraj, Rupani, Jajale 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 transformers. 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.

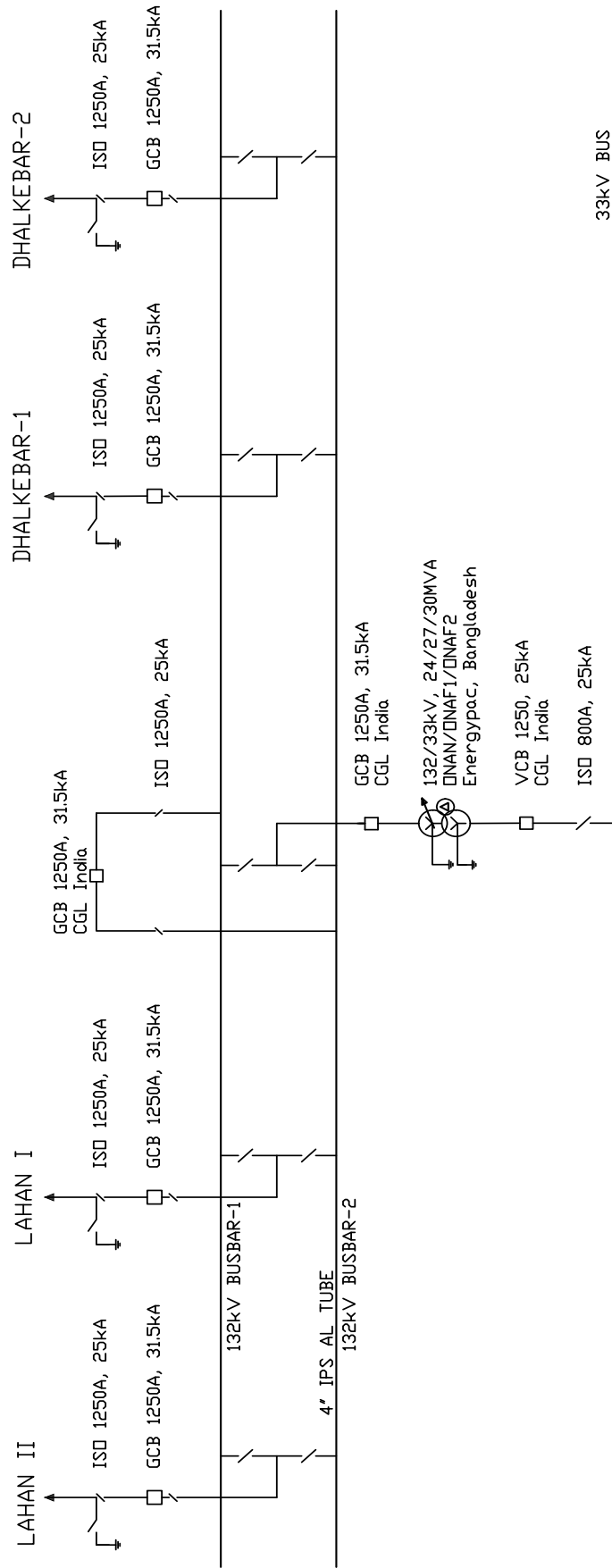
Installed Capacity: 132/33kV, 63MVA  
Maximum Demand: 34.29MVA



## 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.

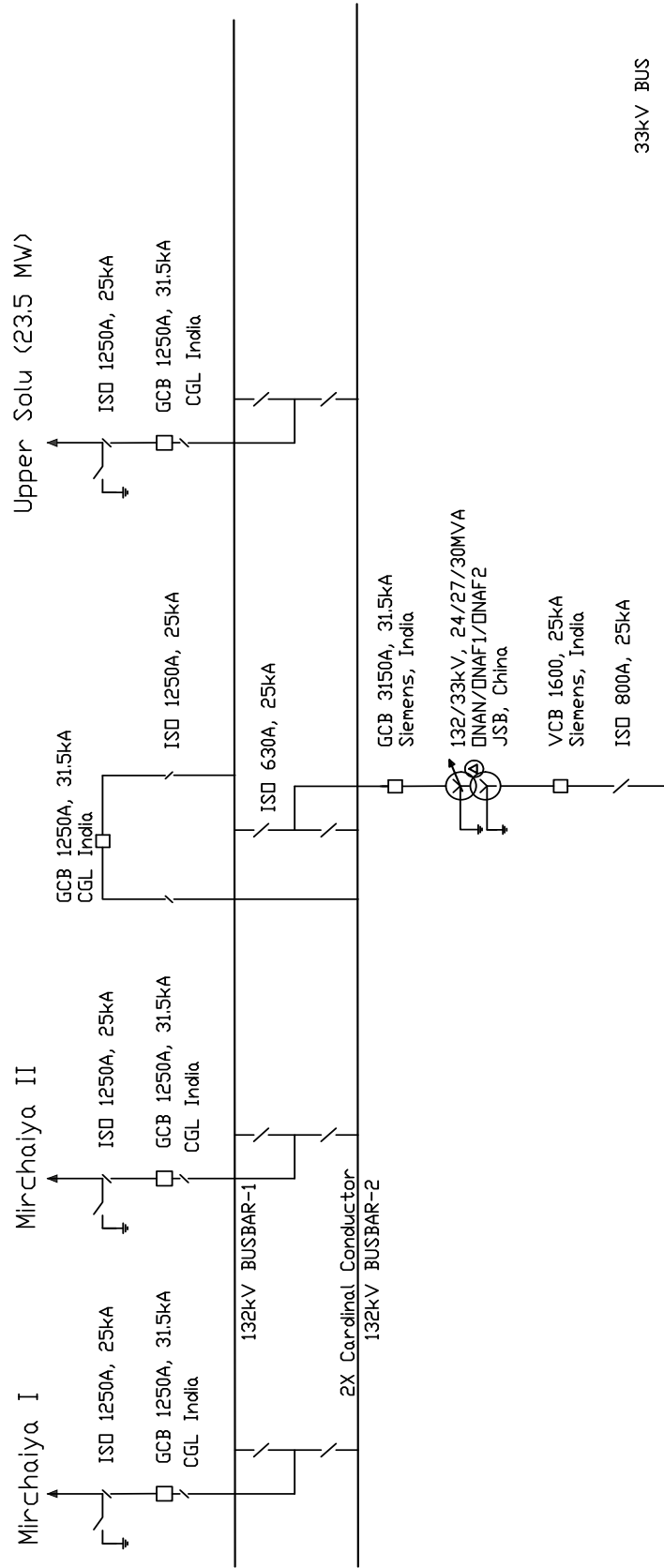
Installed Capacity : 132/33kV, 30MVA  
Maximum Demand : 19.66MVA



## 11. TINGLA SUBSTATION

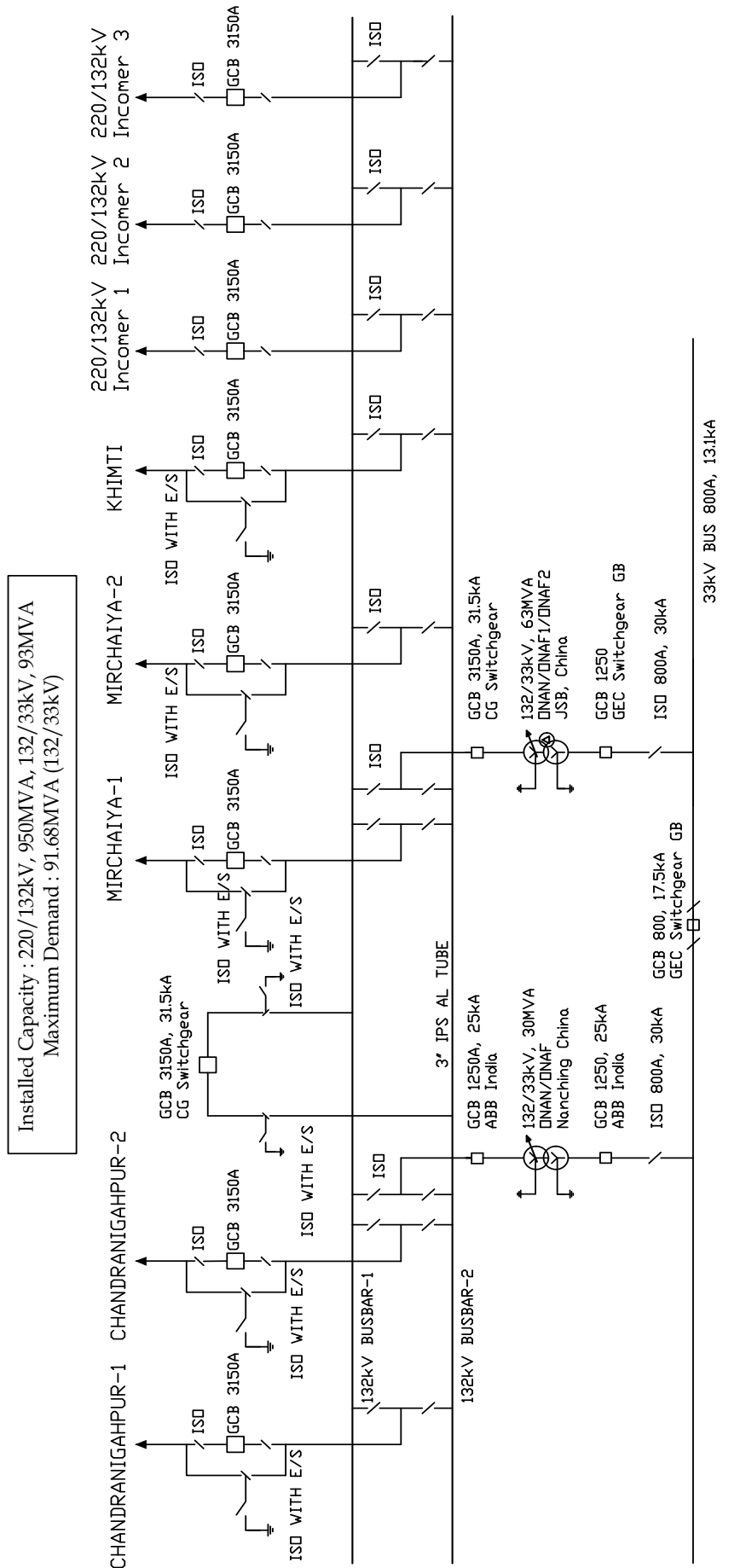
Tingla Substation with Double Bus System located at Tingla (Solu-Dudhkunda Nagarpalika) of Solukumbu District, Janakpur zone feeds power to Solukumbu and Okhaldunga Districts and to evacuate Hydropower generated Tingla Areas. Tingla Substation will be connected with Michaiya Substation and 23.5 MW Upper Solu Hydropower.

Installed Capacity : 132/33kV, 30MVA  
33/11 kV, 8 MVA  
Maximum Demand : 5 MVA



## 12. 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.

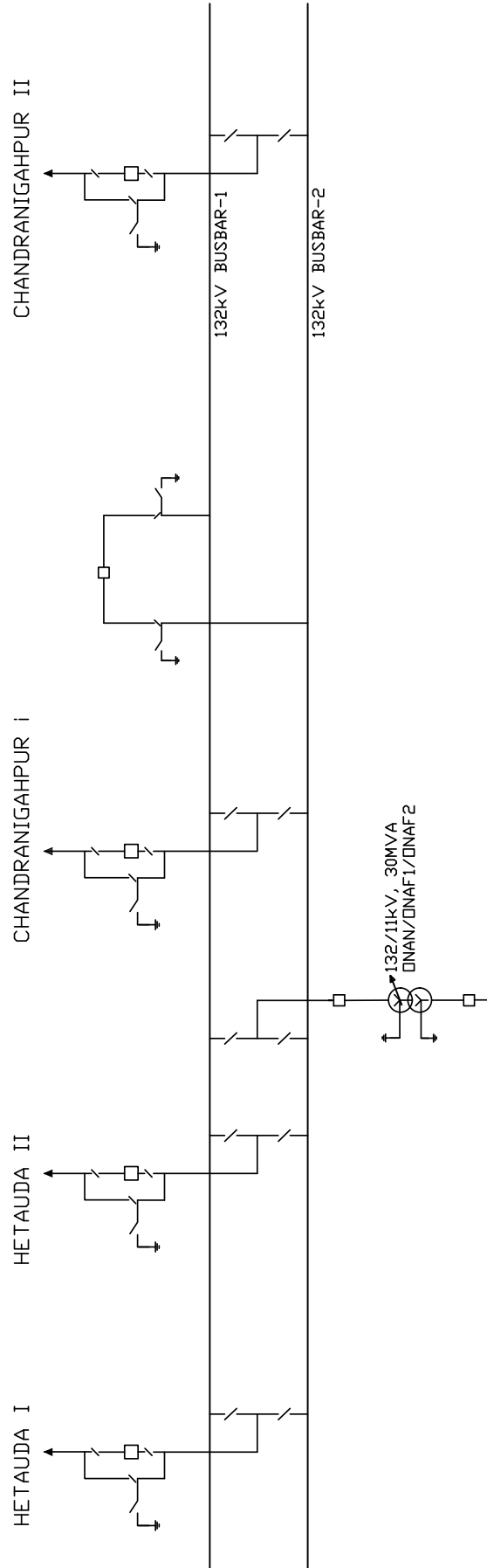




## 14. PATHLAIYA SUBSTATION

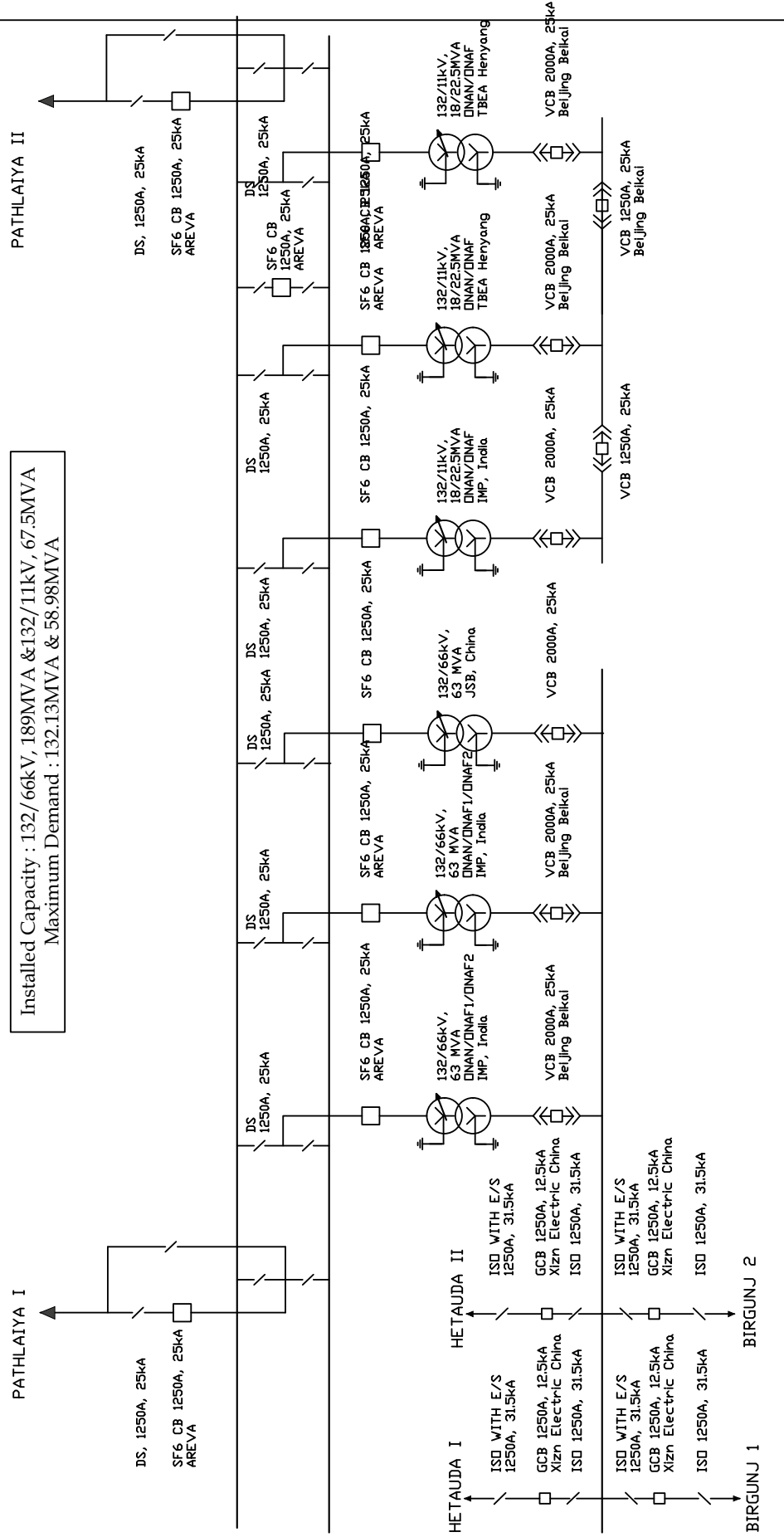
Pathlaiya Substation with Double Bus System located at Piliuwa of Bara district, Narayani zone feeds power to Pathlaiya, Piliuwa and Badhaharwa. Pathlaiya Substation is connected with Hetauda and Chandranigahpur Substation through 132kV Lines. Pathlaiya Substation was commissioned in 2012 with one no.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

Installed Capacity : 132/11kV, 22.5MVA  
Maximum Demand : 12.12 MVA



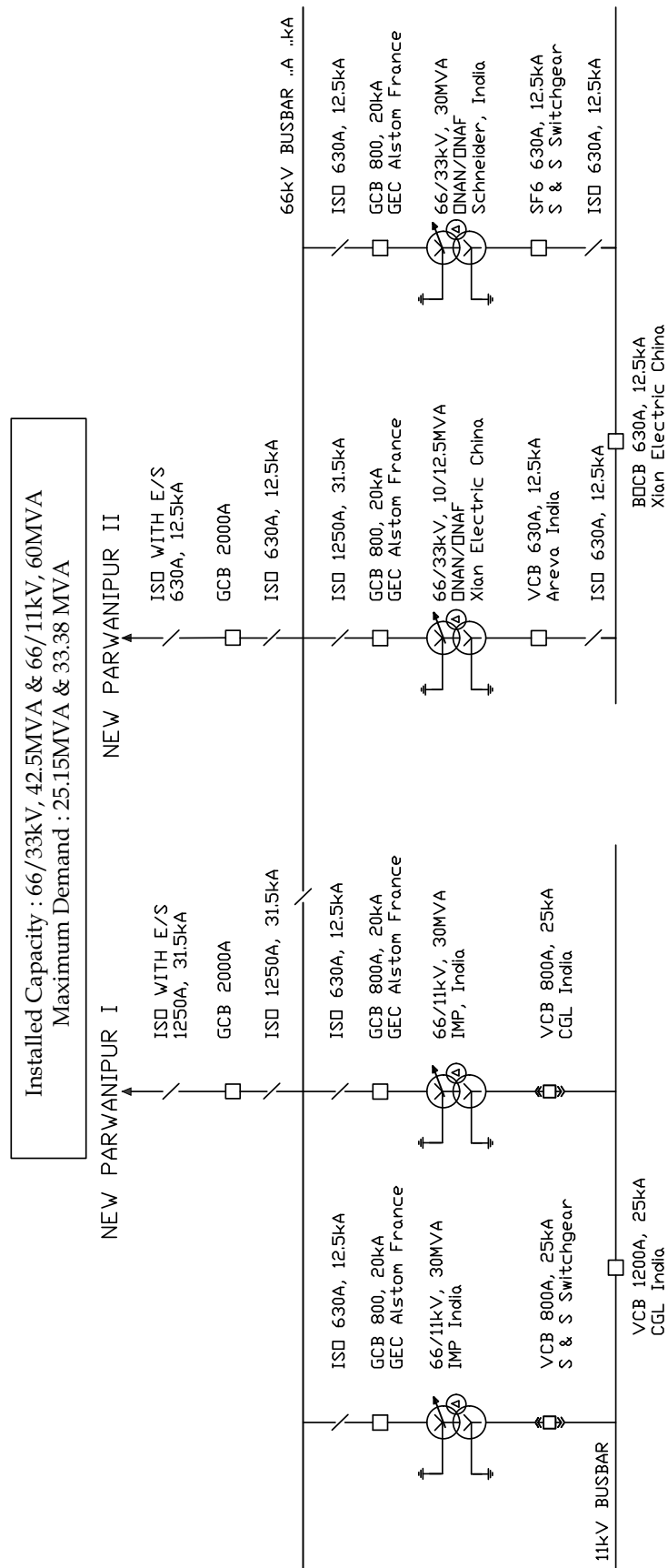
## 15. NEW PARWANIPUR SUBSTATION

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 beginning 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 and 132/66kV, 63MVA Transformer Bay was added in 2021.



## 16. BIRGUNJ SUBSTATION

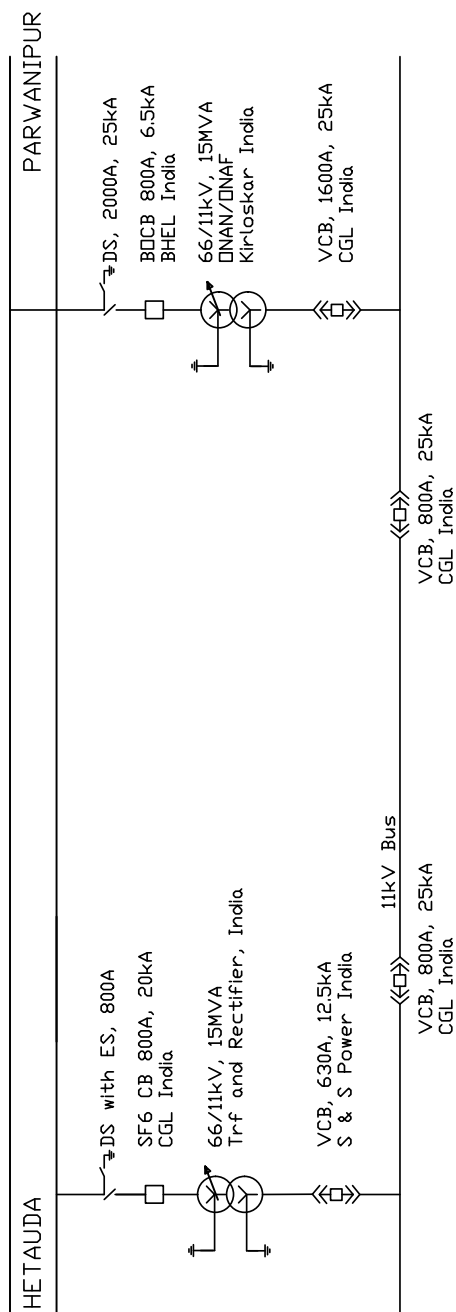
Birgunj substation located at Birgunj Sub metropolitan city of Parsa district, Narayani zone feeds power to Pokhariya, Raxaul, Kalaiya and Birgunj city. Birgunj substation is connected with Hetauda substation through 66kV Double Circuit Transmission Line. Birgunj Substation was commissioned in 1972 with 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. One of the 66/33kV, 12.5MVA was upgraded to 30MVA in 2019.



## 17. 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 replaced by 2x15MVA Transformers. 6MVA Transformer has been out of service since 2015.

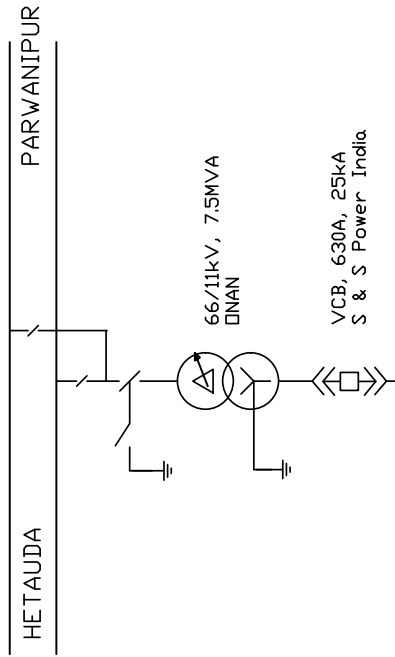
Installed Capacity : 66/11kV, 30MVA  
Maximum Demand : 14.67 MVA



## 18. 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.

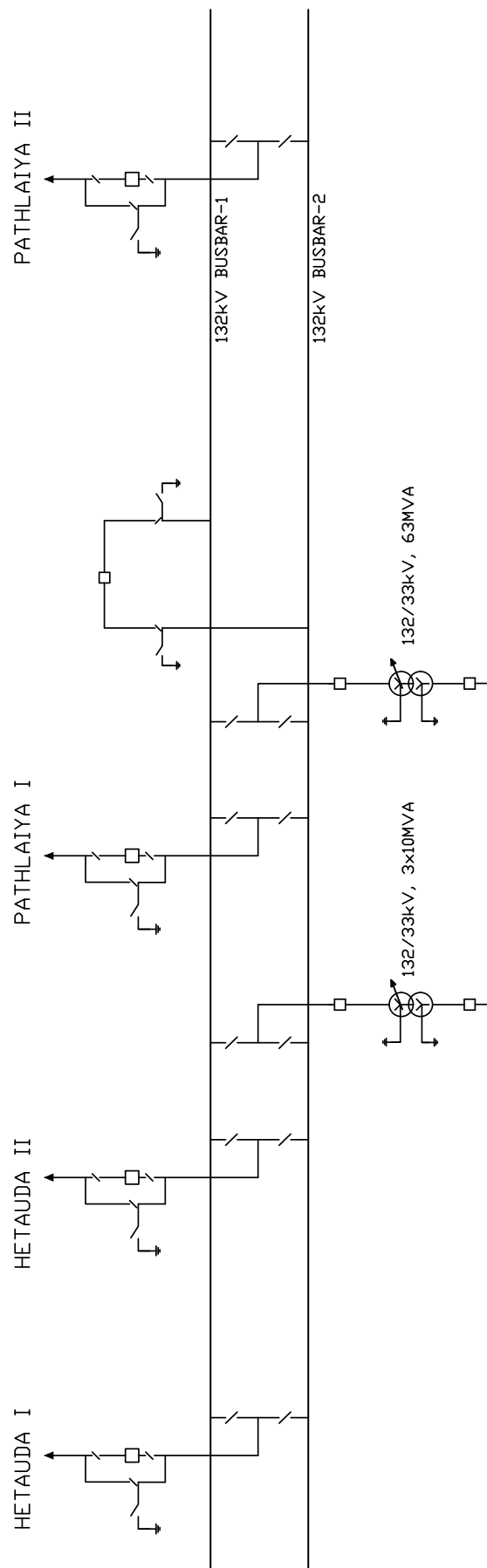
Installed Capacity : 66/11kV, 7.5MVA  
Maximum Demand : 1.83MVA



## 19. KAMANE SUBSTATION

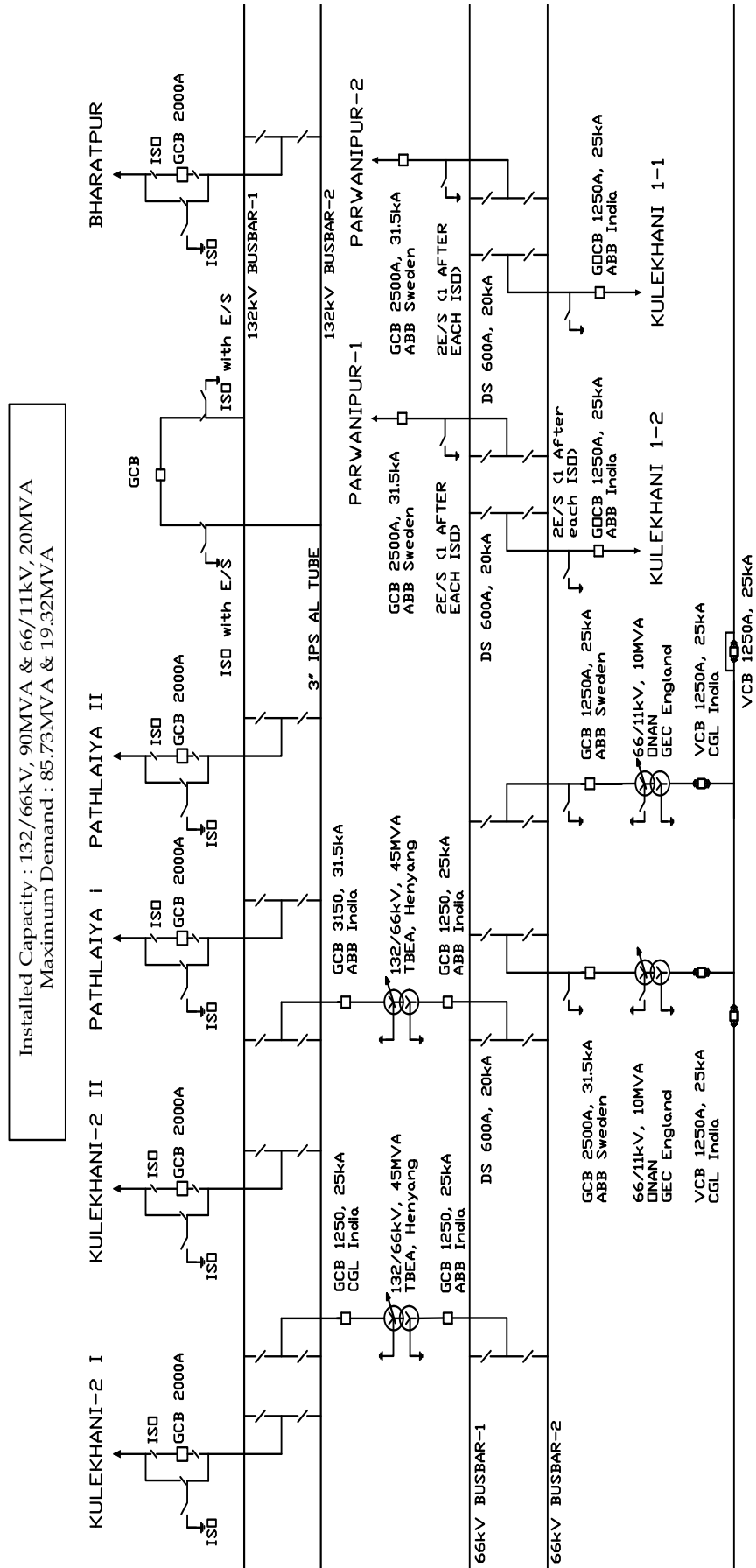
Kamane Substation with Double Bus System located at Kamane of Makwanpur district, Narayani zone feeds power to Shivam Cement and Hetauda Industrial District. Kamane Substation is connected with Hetauda and Pathlaiya Substation through 132kV Lines. Kamane Substation was commissioned in 2015 with one set of single phase 132/33kV, 3x10MVA capacity. The substation was further upgraded with the 132/33kV, 63MVA Bay.

Installed Capacity : 132/33kV, 93MVA & 33/11 KV 16.6 MVA  
Maximum Demand : 63.56MVA & 7.60MVA



## 20. HETAUDA SUBSTATION

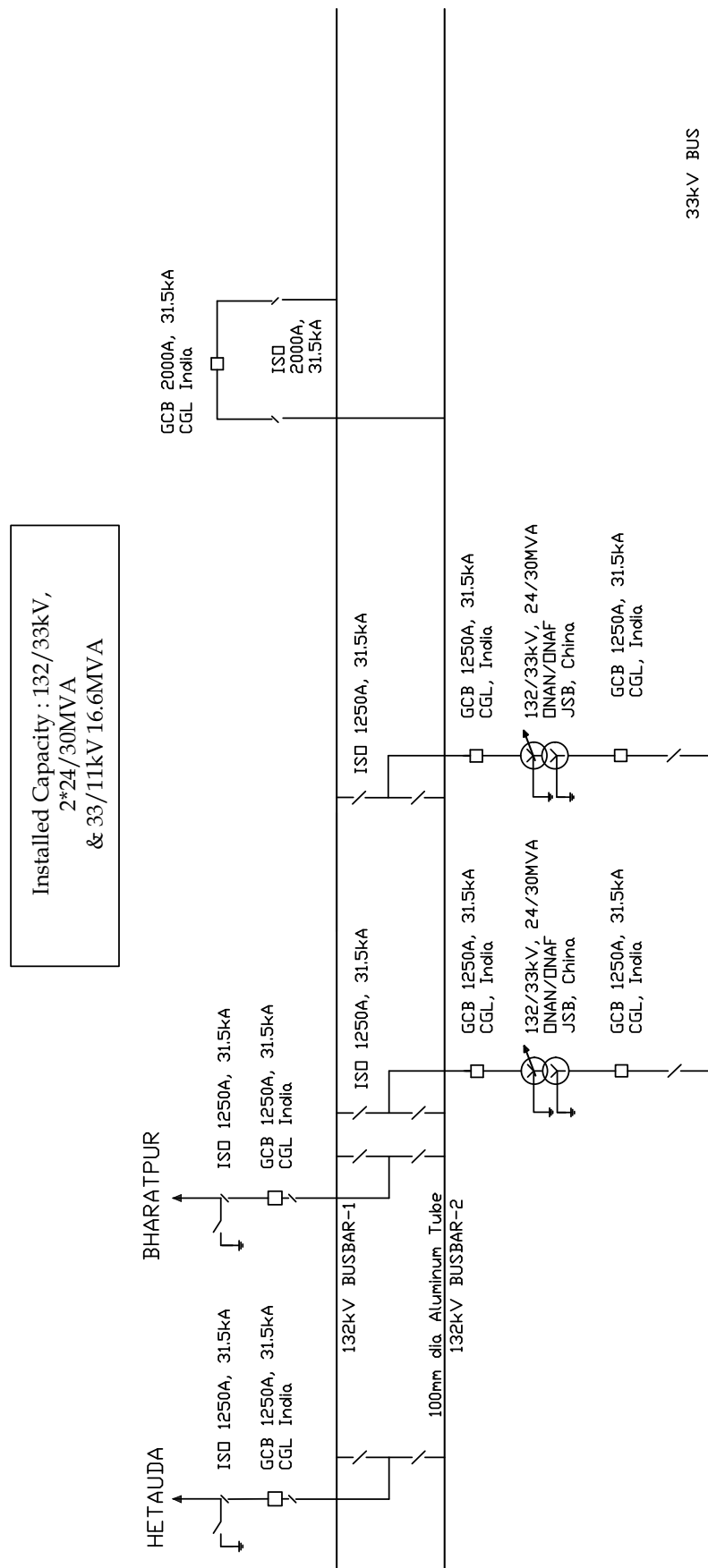
Hetauda Substation with Double Bus System in both 132kV and 66kV Voltage level located at Hetauda municipality of Makwanpur district, Narayani zone feeds power to Chaughada, HHD and Bhainse. Hetauda Substation is fed by Kulekhani II Power House through 132kV Single Circuit Line and Kulekhani I Power 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 Transformers was replaced by two 10MVA Transformers by 2009. The existing  $\frac{132}{66}$ kV, 2x20MVA was further upgraded to 2x45MVA in 2015.





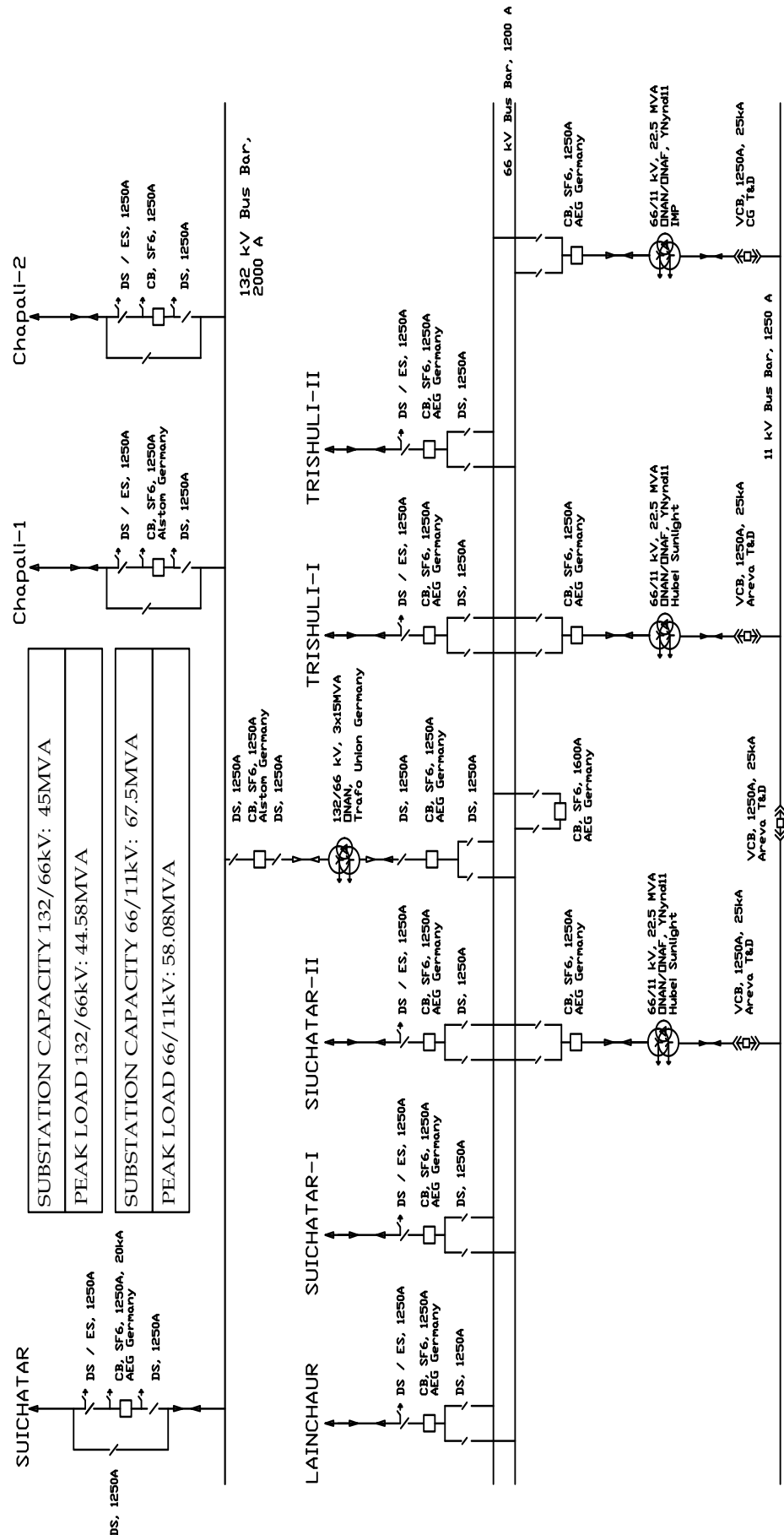
22. PURBI CHITWAN 132/33/11 kV SUBSTATION

Purbi Chitwan Substation with Double Bus System located at Rapti M.P-06, Hardi, Chitwan feeds power to existing 33/11 kV Parsa Substation via 33kV double circuit sub-transmission line and to the area nearby substation via 11kV feeders. Purbi Chitwan Substation has Loop in Loop out of Hetauda-Bharatpur 132kV Transmission Line.



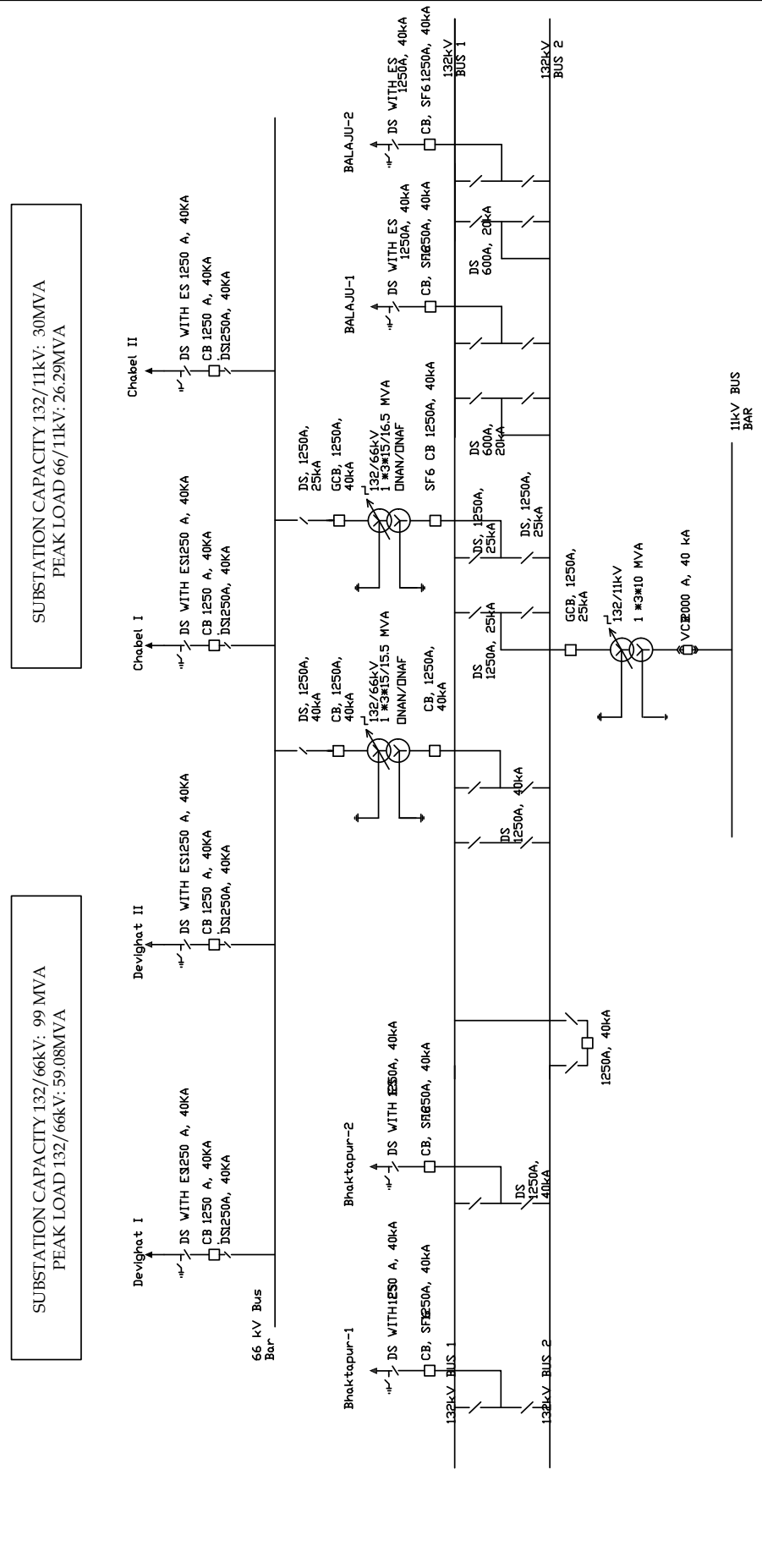
## 23. BALAJU SUBSTATION

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 augmented 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. A bay of 66/11 kV, 22.5 MVA Transformer is added in 2019.



## 24. 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 .

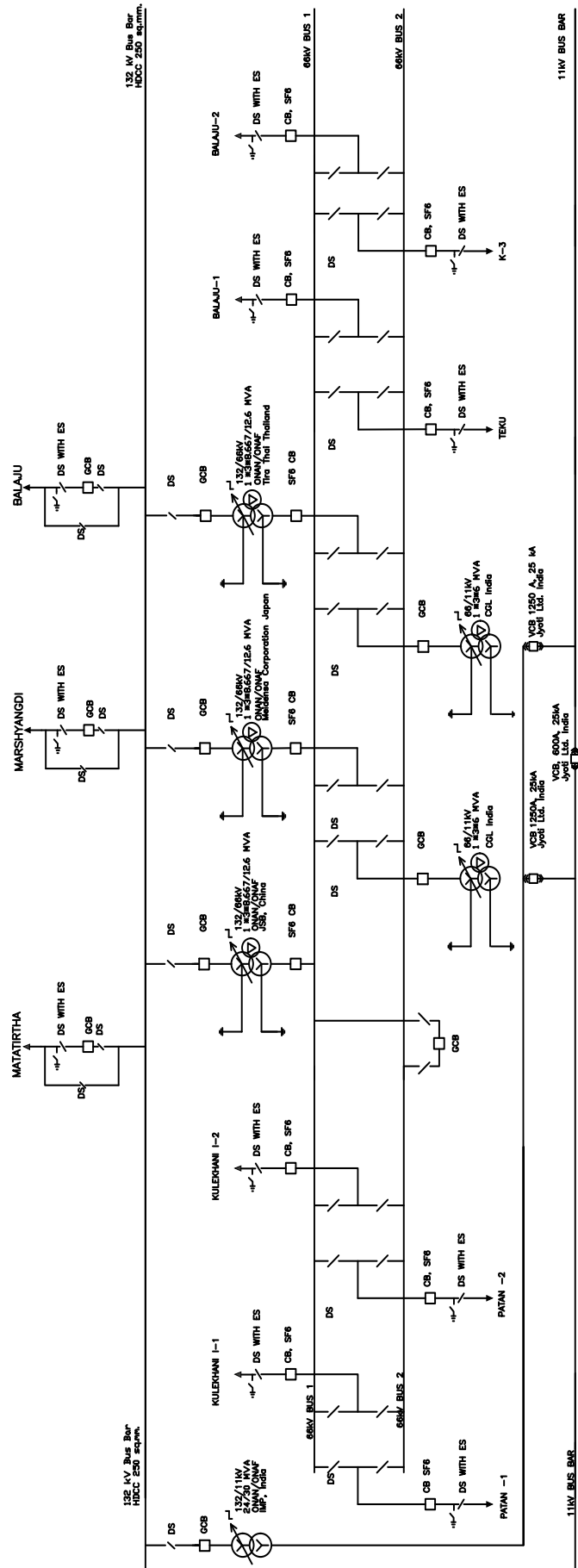


## 25. SIUCHATAR SUBSTATION

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 Substation 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. A new 132/66kV, 30MVA Transformer is installed in 2019. Now all 11 kV feeders feed via 132/11 kV Transformer, to reduce the overload in 66 kV Transmission lines.

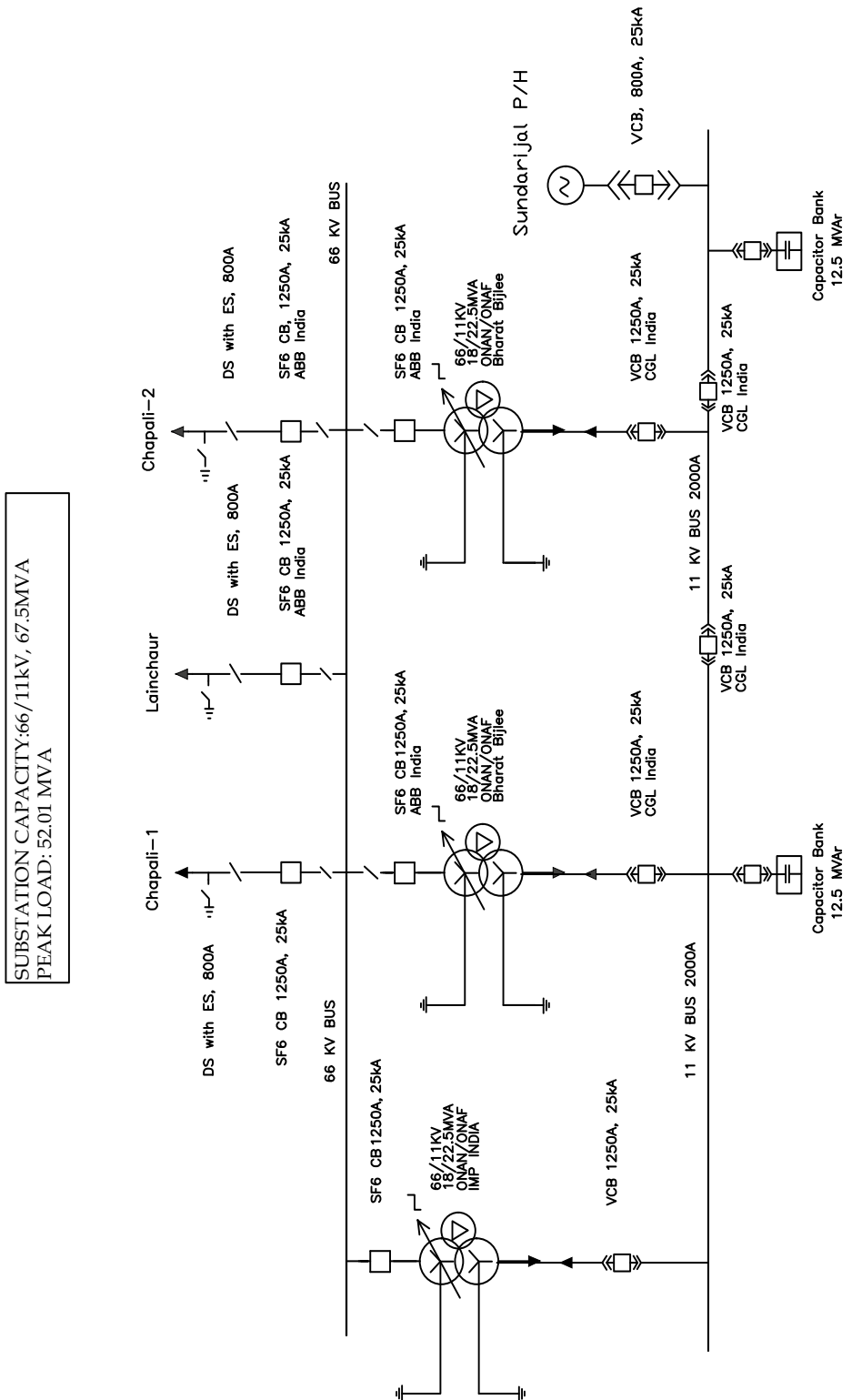
SUBSTATION CAPACITY 132/66kV: 113.4MVA  
PEAK LOAD 132/66kV: 52.59MVA

SUBSTATION CAPACITY 66/11kV: 36MVA  
132/11 kV: 30 MVA  
PEAK LOAD 66/11kV: 28.58 MVA, 66/11kV, 24.01 MVA



## 26. NEW CHABEL SUBSTATION

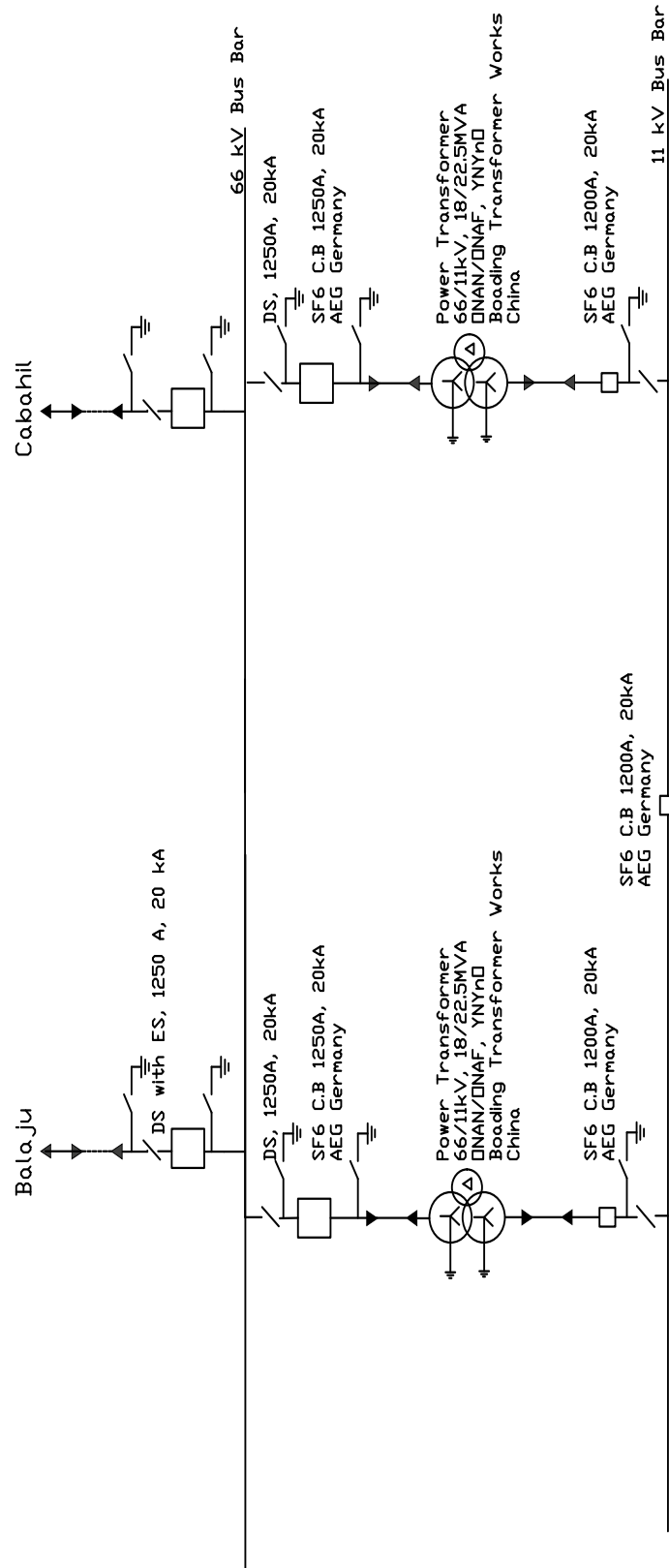
Chabel substation with Single Busbar System located at Chabel of Kathmandu district feeds power to Om Hospital, Sankhu, Maharajgunj Chabel, Mahankal and Sundarijal. This Substation was built in the year 1982 with three 66kV Transformer bays of 66/11kV, 6.3 MVA capacity and two 66kV line bays to evacuate 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 Switchgears were replaced with 12kV VCB Switchgears in FY 2001. With the increased load, three numbers of 66/11kV, 6.3MVA Power Transformers were replaced 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.



## 27. LAINCHAUR SUBSTATION

Laincha Substation with Single Busbar System located at Laincha, Kathmandu feeds power to Keshar Mahal, Samakhushi, 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 occurred, indoor 12kV Vacuum type Switchgears were temporarily commissioned on July 1990 to supply the emergency loads. After 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 Laincha Substation by Kathmandu Valley Reinforcement Project, NEA.

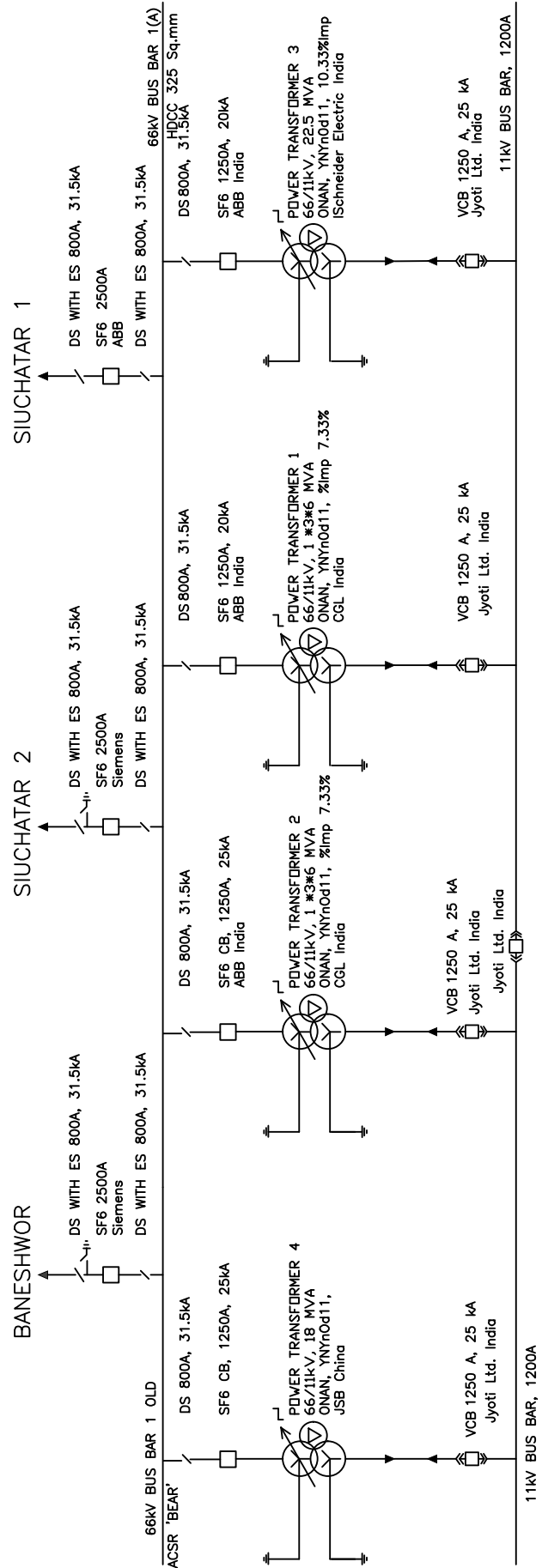
SUBSTATION CAPACITY: 45MVA  
PEAK LOAD 132/66kV: 48.93MVA; 132/11kV: 36.58MVA



## 28. 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 Siuchatar-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 66/11kV, 22.5 MVA Bay.

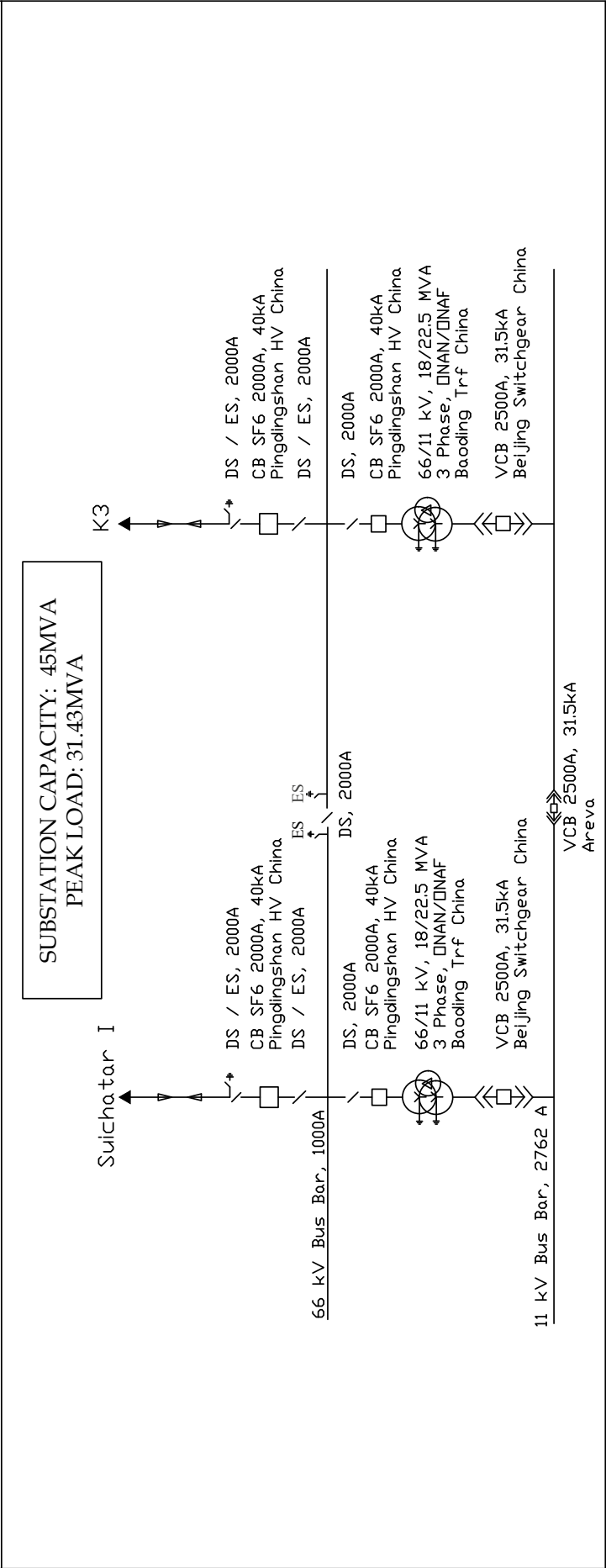
SUBSTATION CAPACITY: 76.5MVA  
PEAK LOAD : 67.79MVA



## 29. TEKU SUBSTATION

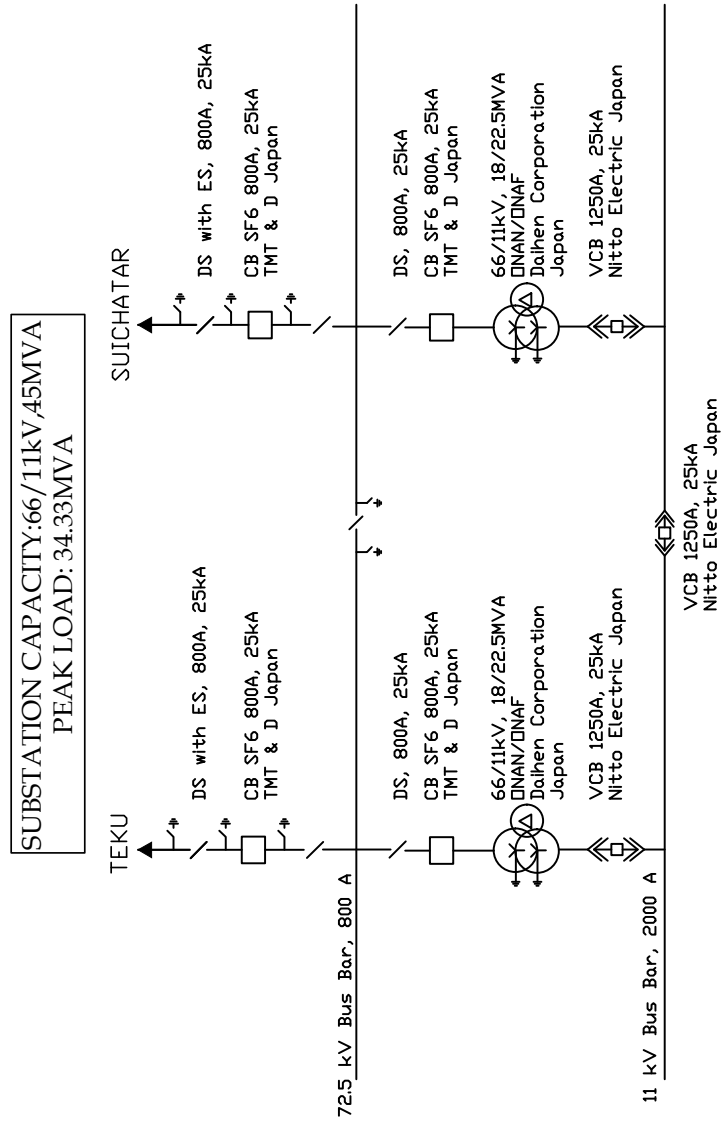
Teku Substation located with Single Bus System in Teku, Kathmandu feeds power to Sundhara, Pulchowk, Thankot, Kirtipur, Tripureshwar, Thapathali, Bhimsenshan, Tahachal, Kalimati. This GIS Substation was built by Kathmandu Valley Reinforcement Project in 1995 with two numbers of 66/11kV bays of 18/22.5MVA 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.

Teku Substation located with Single Bus System in Teku, Kathmandu feeds power to Sundhara, Pulchowk, Thankot, Kirtipur, Tripureshwar, 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.



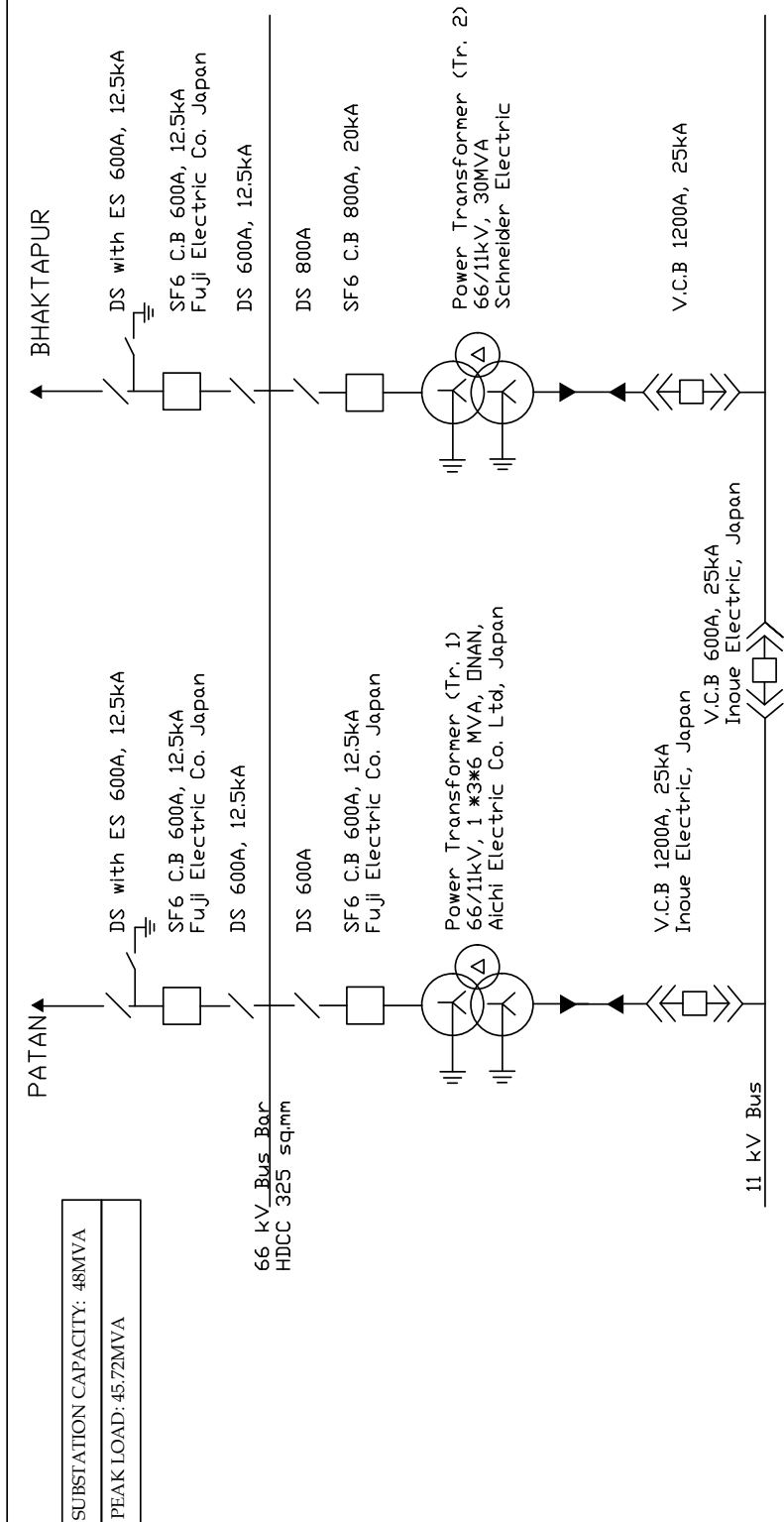
### 30. K-3 SUBSTATION

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.



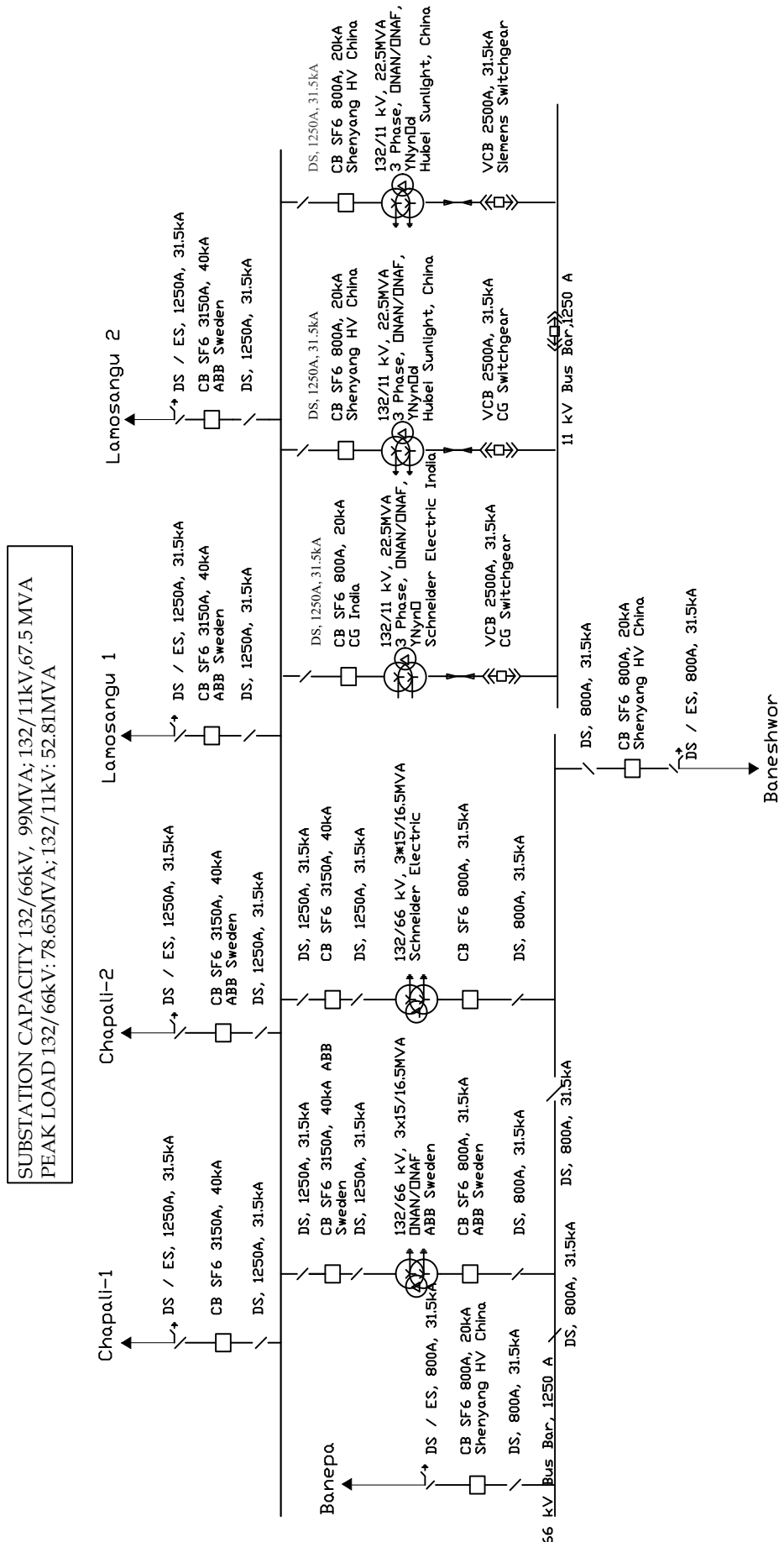
### 31. BANESHWOR SUBSTATION

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. One of the 18MVA Transformer was upgraded to 30MVA in the year 2020.



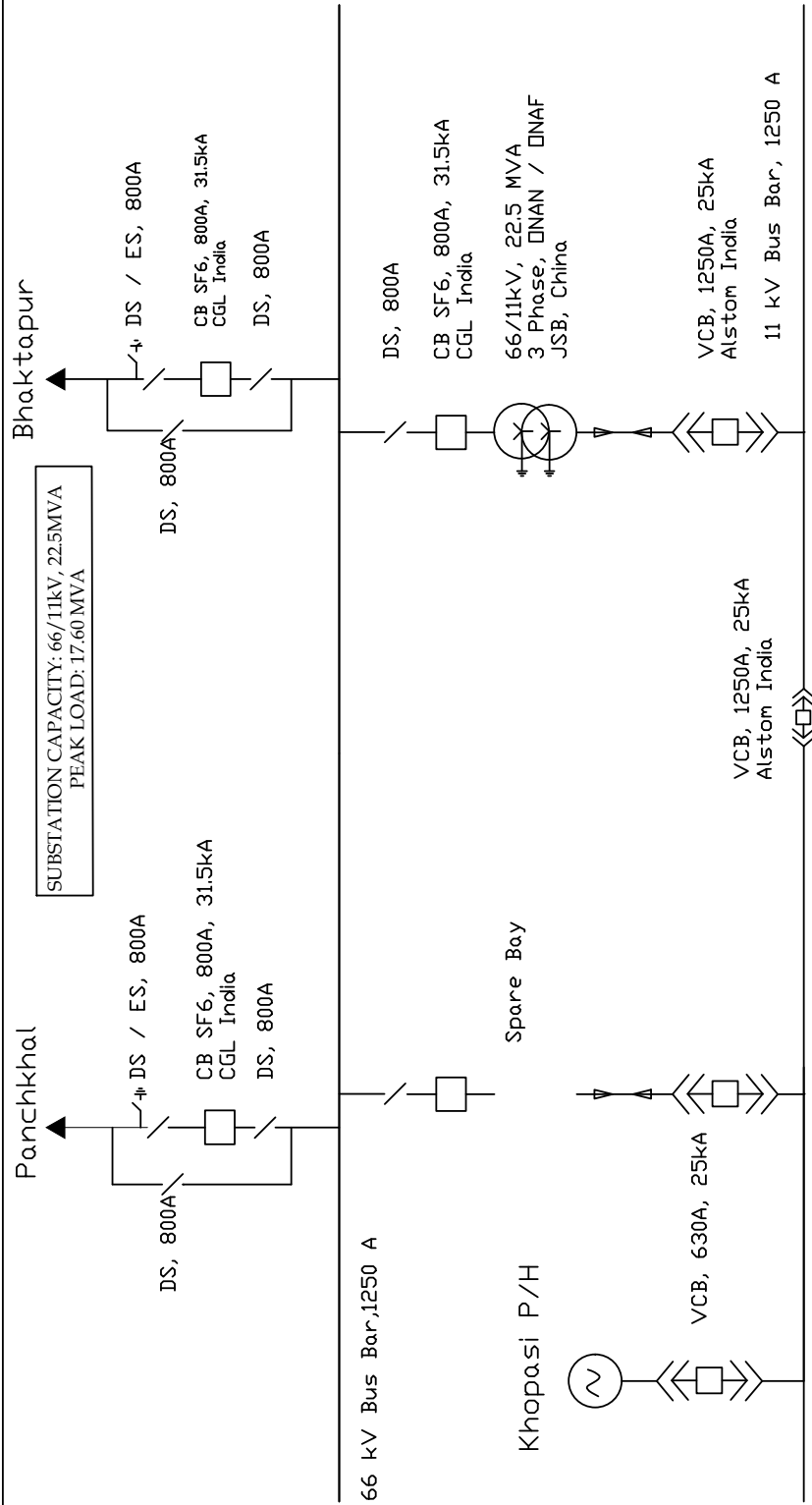
## 32. BHAKTAPUR SUBSTATION

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 Three number of 132/11kV Transformer Bays with capacity 22.5MVA each and 132/66 kV of 2x3x15/16.5 MVA.



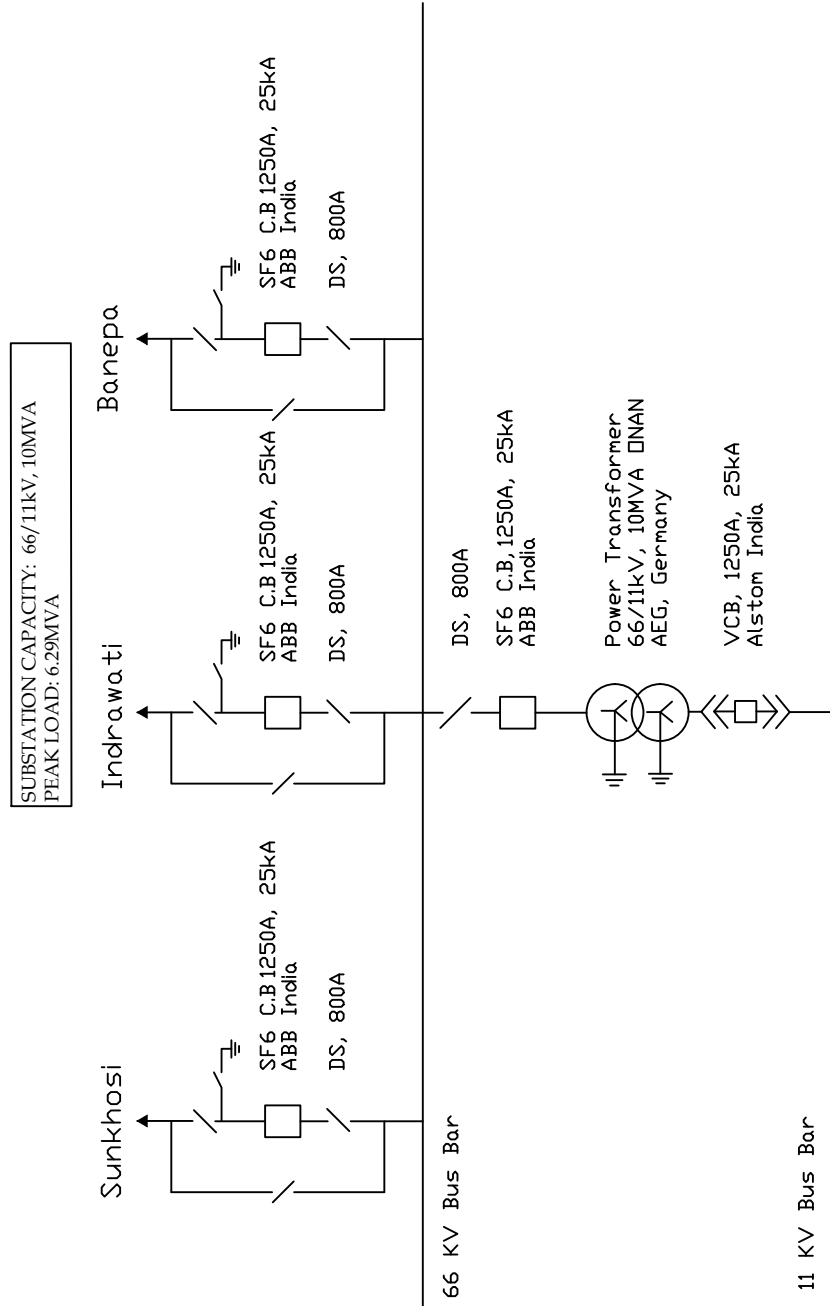
### 33. BANEPA SUBSTATION

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.



### 34. PAANCHKHAL SUBSTATION

Paanchkhal Substation located at Paanchkhal of Kavre District feeds power to Melamchi, Tinipale, Paanchkhal and Palanchowk. Paanchkhal 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  $\pi$ -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.

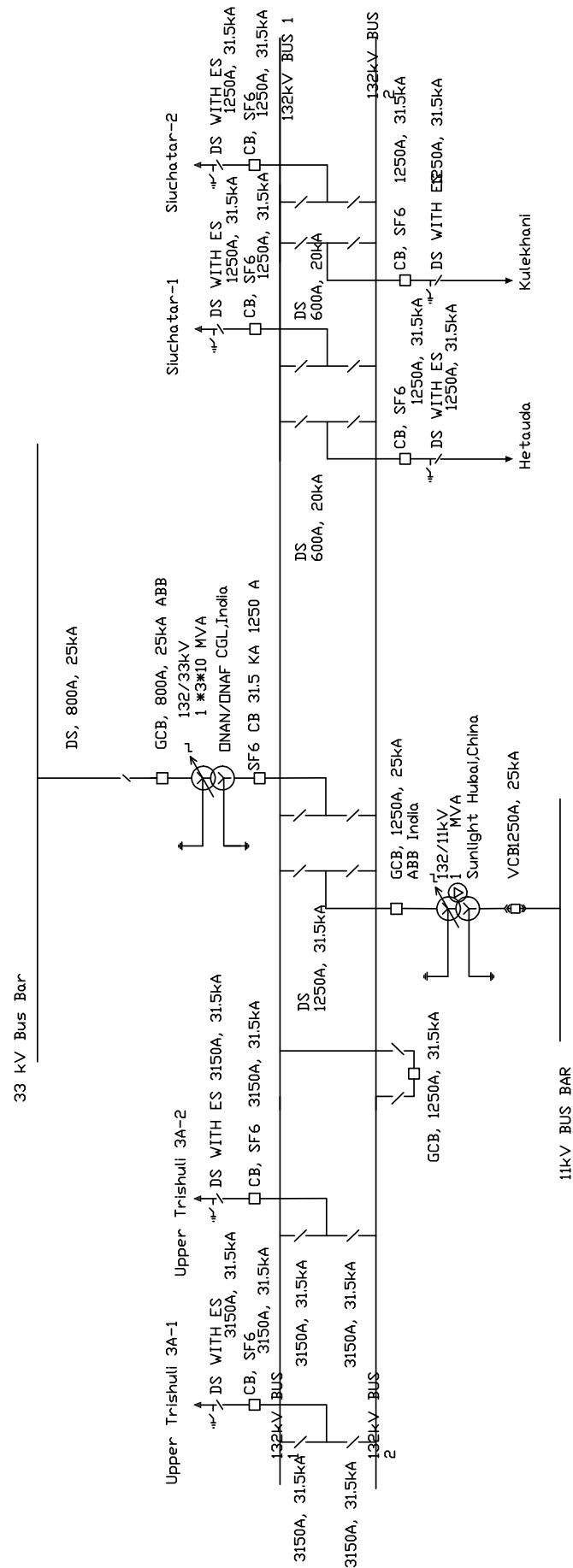




### 36. MATATIRTHA SUBSTATION

Matatritha Substation having double bus system at 132kV level located at Matatritha, 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

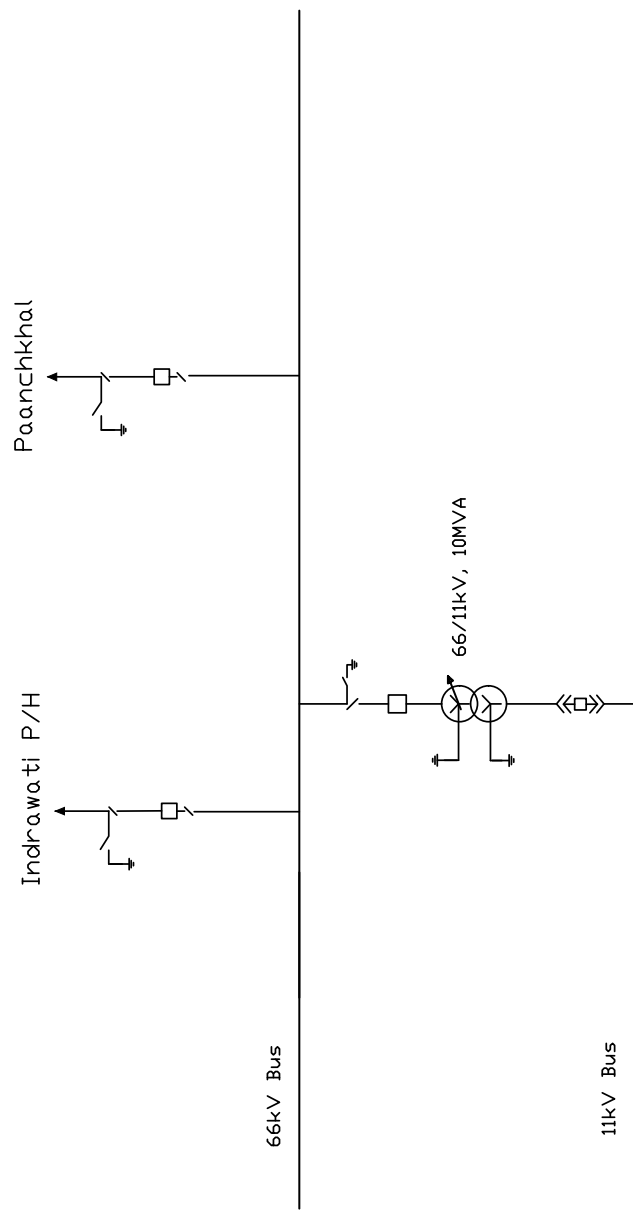
SUBSTATION CAPACITY 132/11kV: 22.5MVA  
SUBSTATION CAPACITY 132/33kV: 30MVA  
PEAK LOAD 132/33kV: 10.63MVA, 132/11kV, 12.80MVA



### 37. 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.

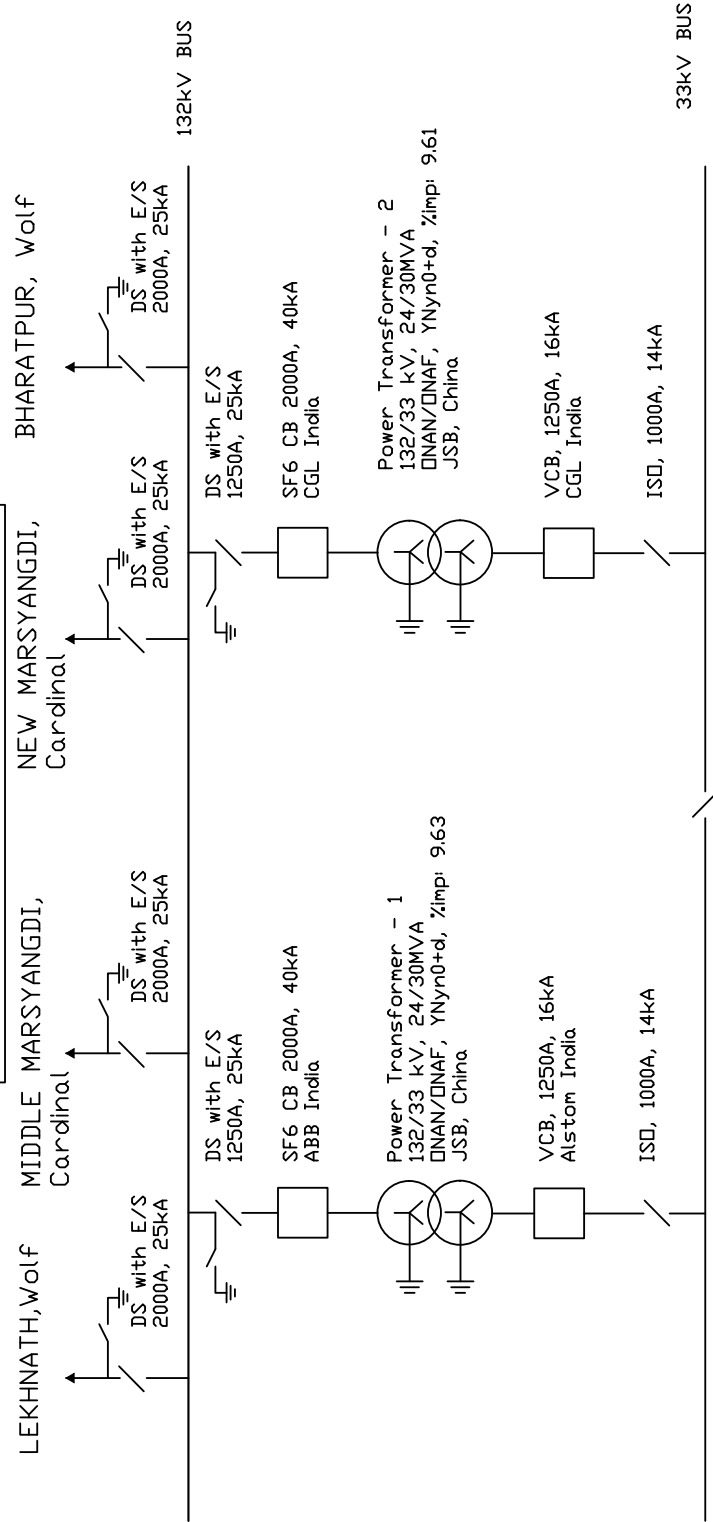
Installed Capacity : 66/11kV, 10MVA  
Maximum Demand : 4.8 MVA



### 38. DAMAULI SUBSTATION

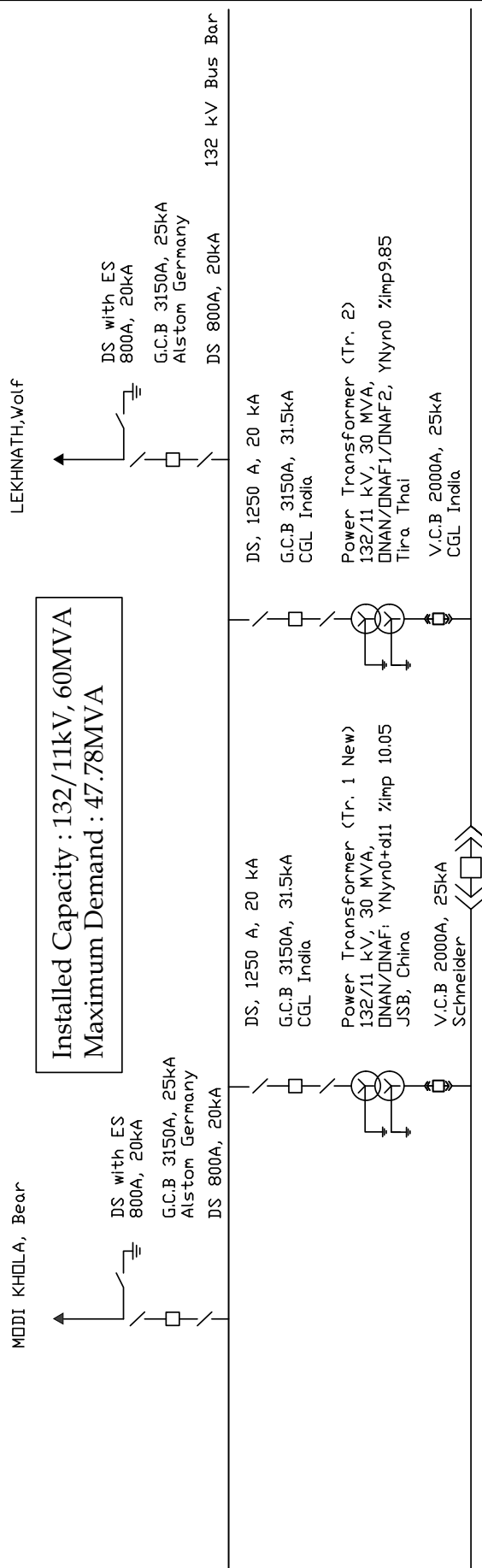
This substation with Single Bus System located at Damauli Municipality in Tanahun district, Gandaki zone feeds power to Aabu Khaireni, Gorkha, Kurintar, Lamjung, Tharpu and Damauli. Damauli Substation is connected by Disconnecting Switches with Lekhnath and Bharatpur Substations through 132kV Single 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

Installed Capacity : 132/33kV, 60MVA  
Maximum Demand : 30.89MVA



### 39. POKHARA SUBSTATION

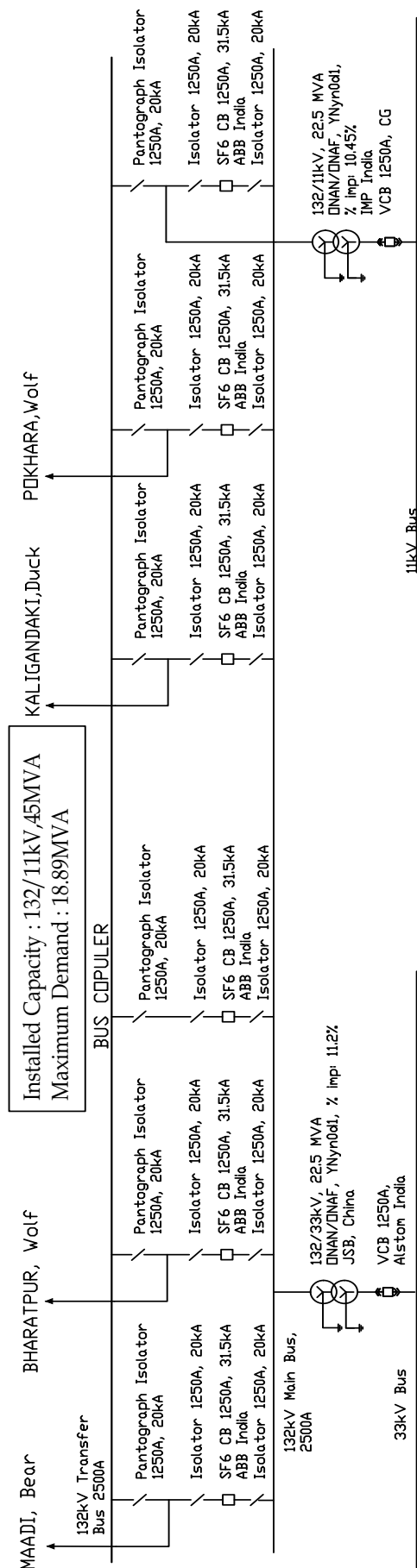
Pokhara Substation with Single busbar system located at Pokhara Sub-Metropolitan city of Kaski district, Gandaki zone feeds power to Hemja, Armala, PID, Pokhara City, Fewa, Arwa, Sarangkot and Baidam. Pokhara Substation is fed by Modi Power House through 132kV Single Circuit Line. Pokhara Substation 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 decommissioned by the substation reinforcement project. In 2014 15MVA Transformer was replaced by 30 MVA Transformer.



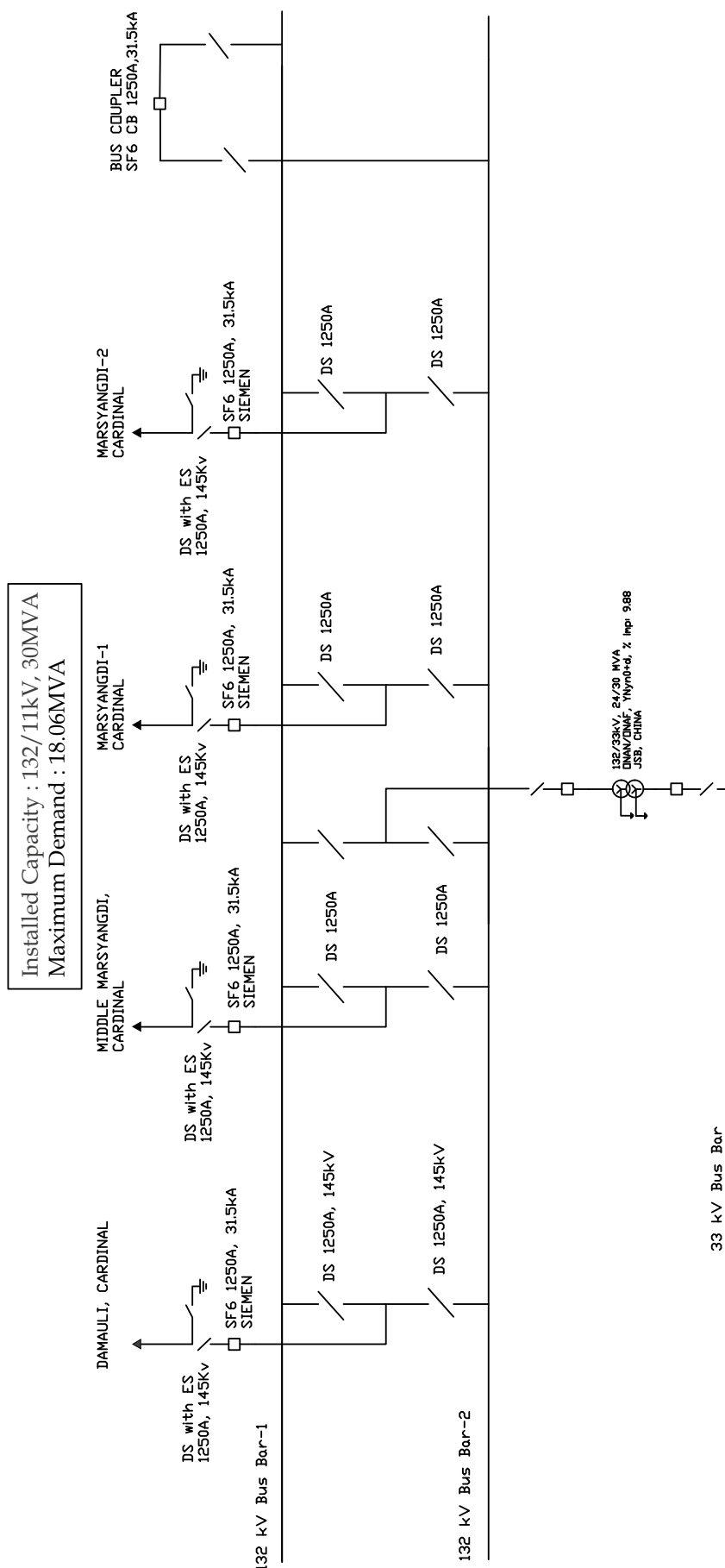
12 NOS. OF 11 KV FEEDERS 6 FEEDERS PER INCOMER

## 40. 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. Lekhnath Substation is fed by Kaligandaki Power House through 132kV Single Circuit Line. This Substation is connected with Pokhara and Damauli Substations through 132kV Lines. This Substation was commissioned in 2002 with 132/11kV, 22.5MVA capacity. Further a new 132/11kV 22.5MVA Transformer was installed in 2020 making the total capacity to 45MVA.



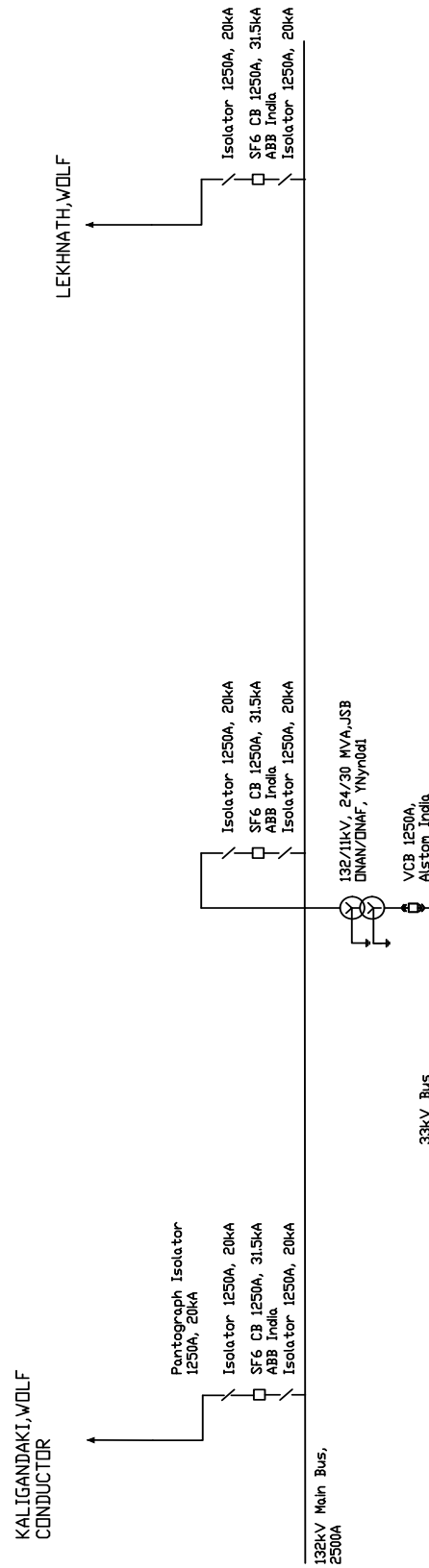
New Marsyangdi substation is a double bus bar system. This Substation is located at Markichowk of Tanahu district of Gandaki zone feeds power to Anbookhaireni(TANAHU) and Gorkha DISTRICT. The availability of 132 kV at this SS is used for stepping up to 220 kV for Marsyangdi-Kathmandu 220 kV TLP. This substation is connected to Damauli SS Middle Marsyangdi HEP 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 transfer 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.



## 42. 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.

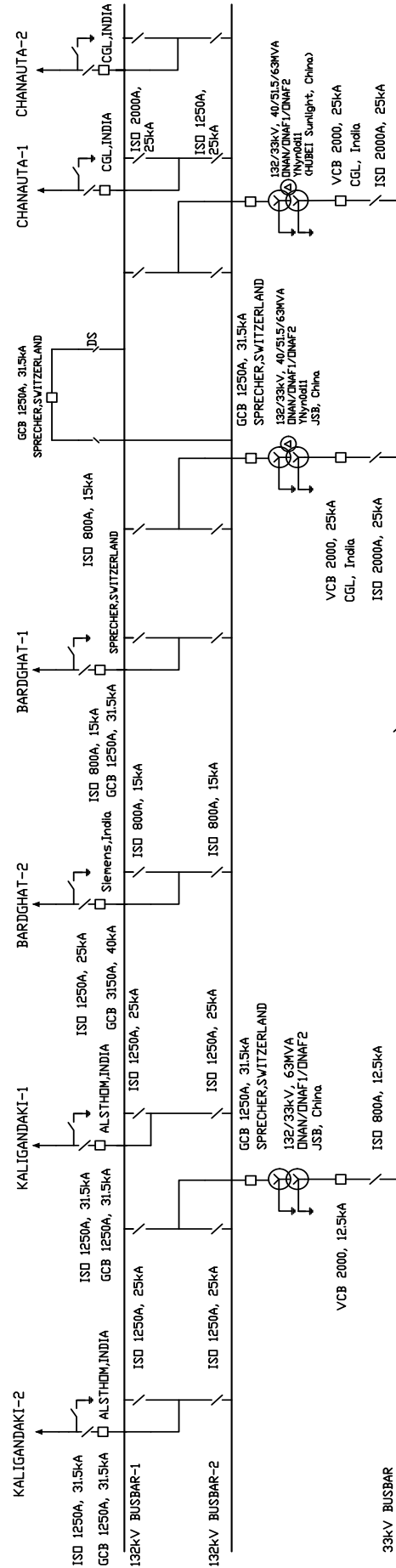
Installed Capacity : 132/33kV, 30MVA  
Maximum Demand: 11.77 MVA



### 43. 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 substation is connected to Kaligandaki Power house and Bardaghat substation by 132kv double circuit line. It is also connected to Chanauta substation 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 replaced with 30MVA in 2005. Two line bays are constructed in 2002 to evacuate the power from Kaligandaki 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.

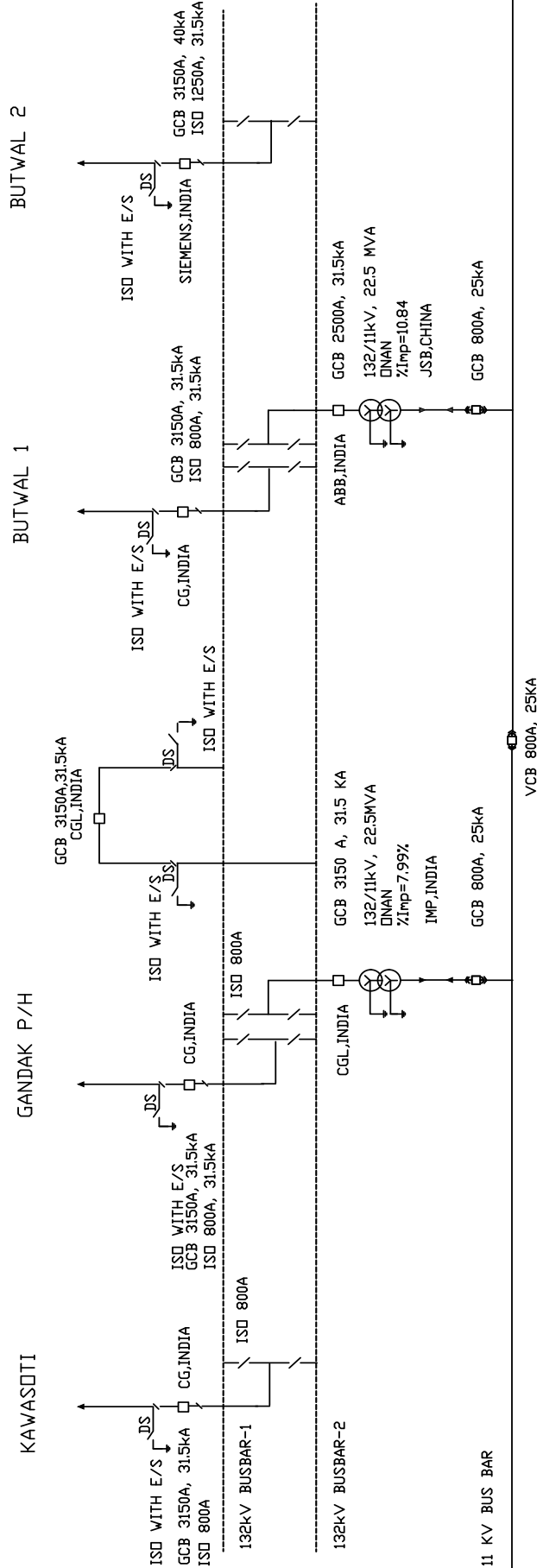
Installed Capacity : 132/33kV, 189MVA  
Maximum Demand : 190.21 MVA



## 44. BARDAGHAT SUBSTATION

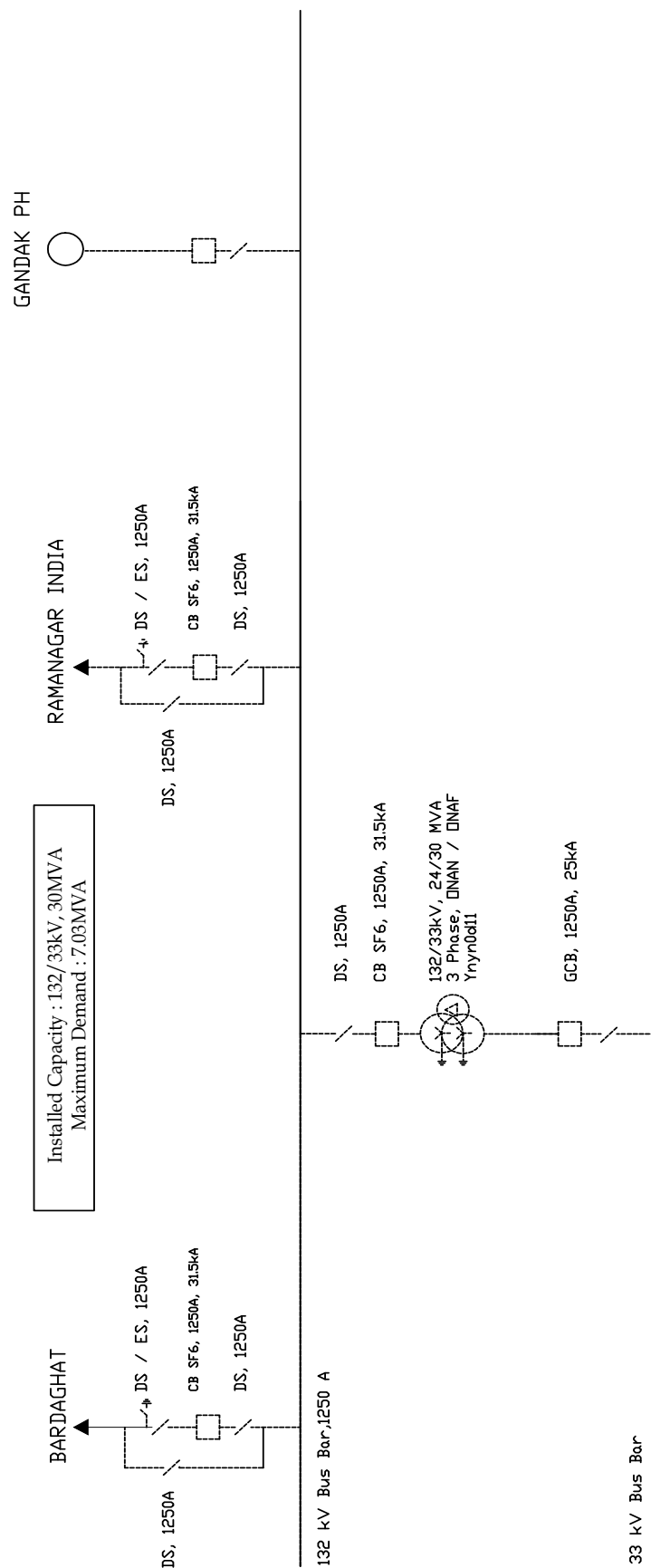
Bardaghat substation with Double Bus system, located at Bardaghat of Nawalparasi district of Lumbini Zone feeds power to Bardaghat, Sunawal, Pratappur and Dumkibas. This substation is connected to Gandak Power House and Bharatpur substation by 132kV single circuit line. It is also connected to Butwal 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 30 MVA in 2017. Further the existing 7.5MVA was upgraded to 22.5MVA in 2020.

Installed Capacity : 132/11kV, 45MVA  
Maximum Demand : 15.25MVA



## 45. GANDAK SUBSTATION

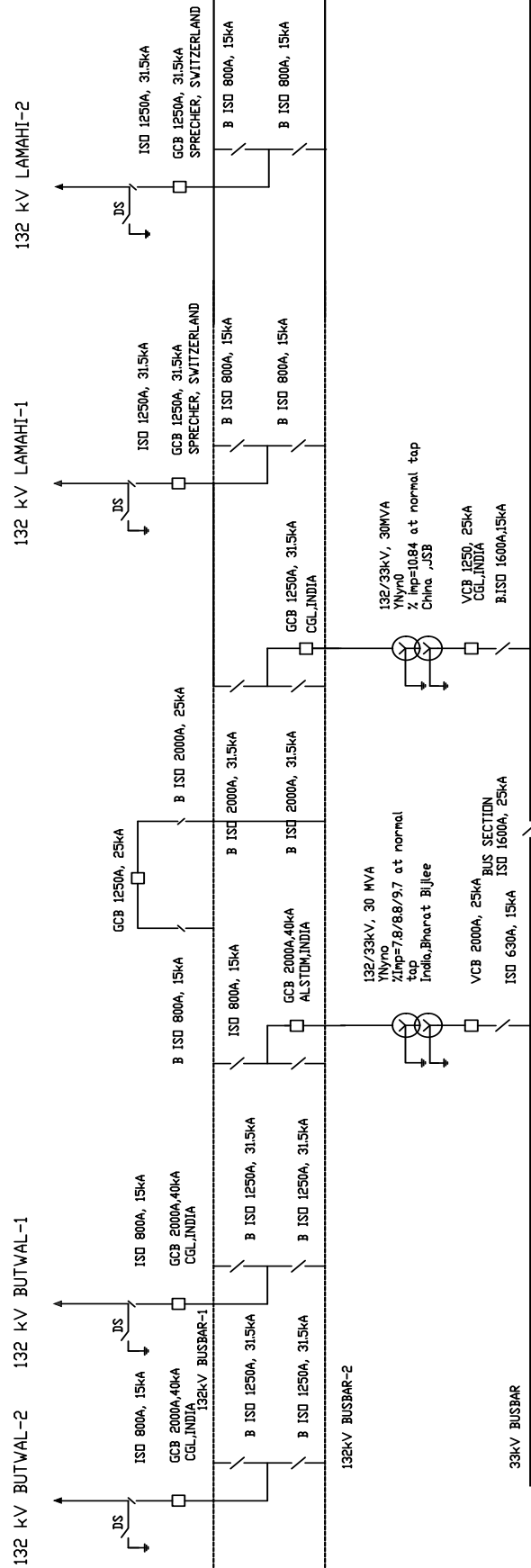
Gandak Substation with single bus system located at Surajpura of Parasi District, feeds power to Parasi and Surajpura area. This substation was built in 2018 A.D. with 132/33 kV, 30 MVA Transformer. This Substation is connected with Bardaghat S/S and Ramnagar (India) through 132kV Single Circuits. Gandak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



## 46. 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 substation 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 & 12.5 MVA Transformer was upgraded to 24/30 MVA in 2020.

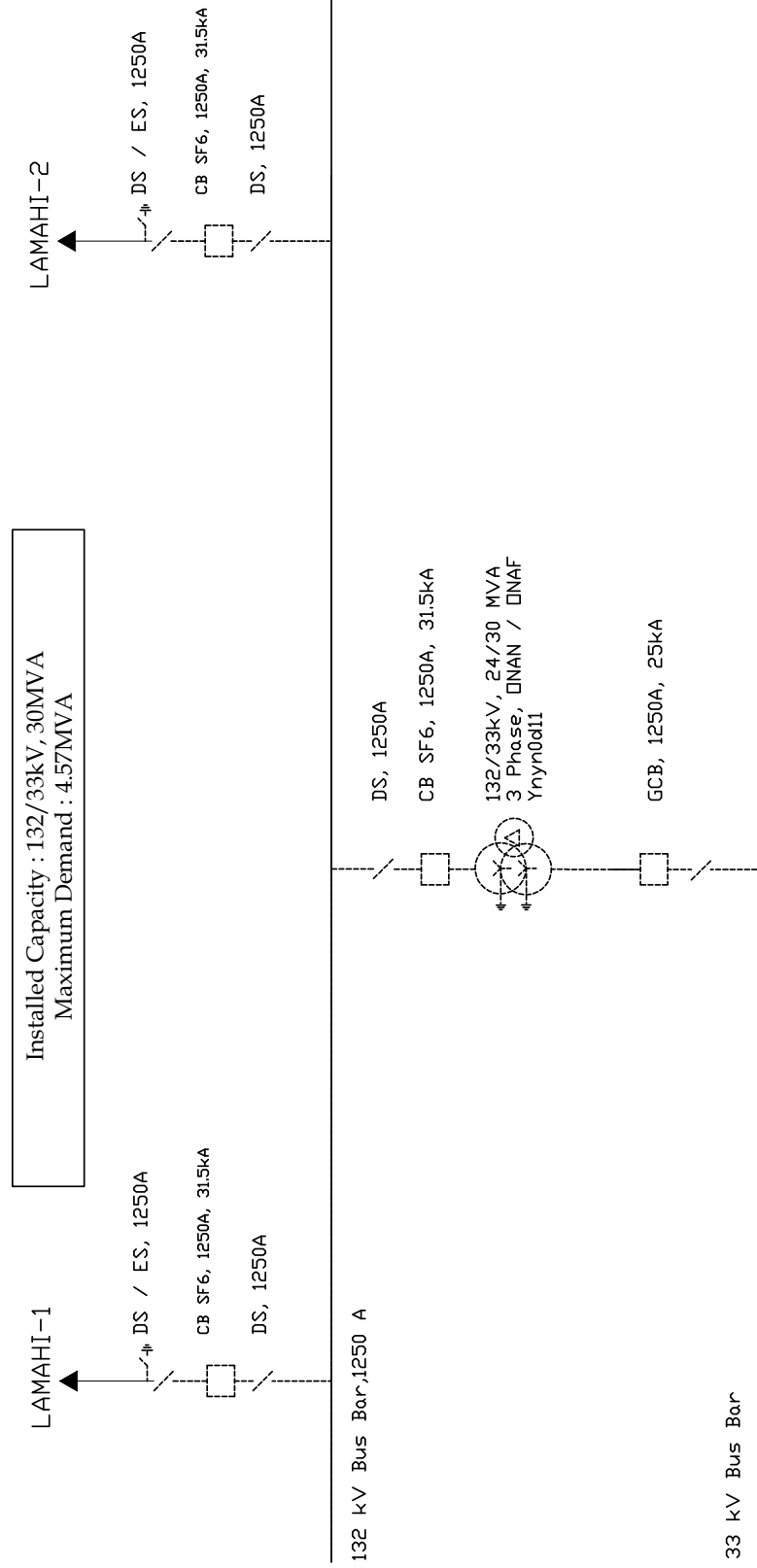
Installed Capacity : 132/33kV, 60MVA  
Maximum Demand : 51.66 MVA





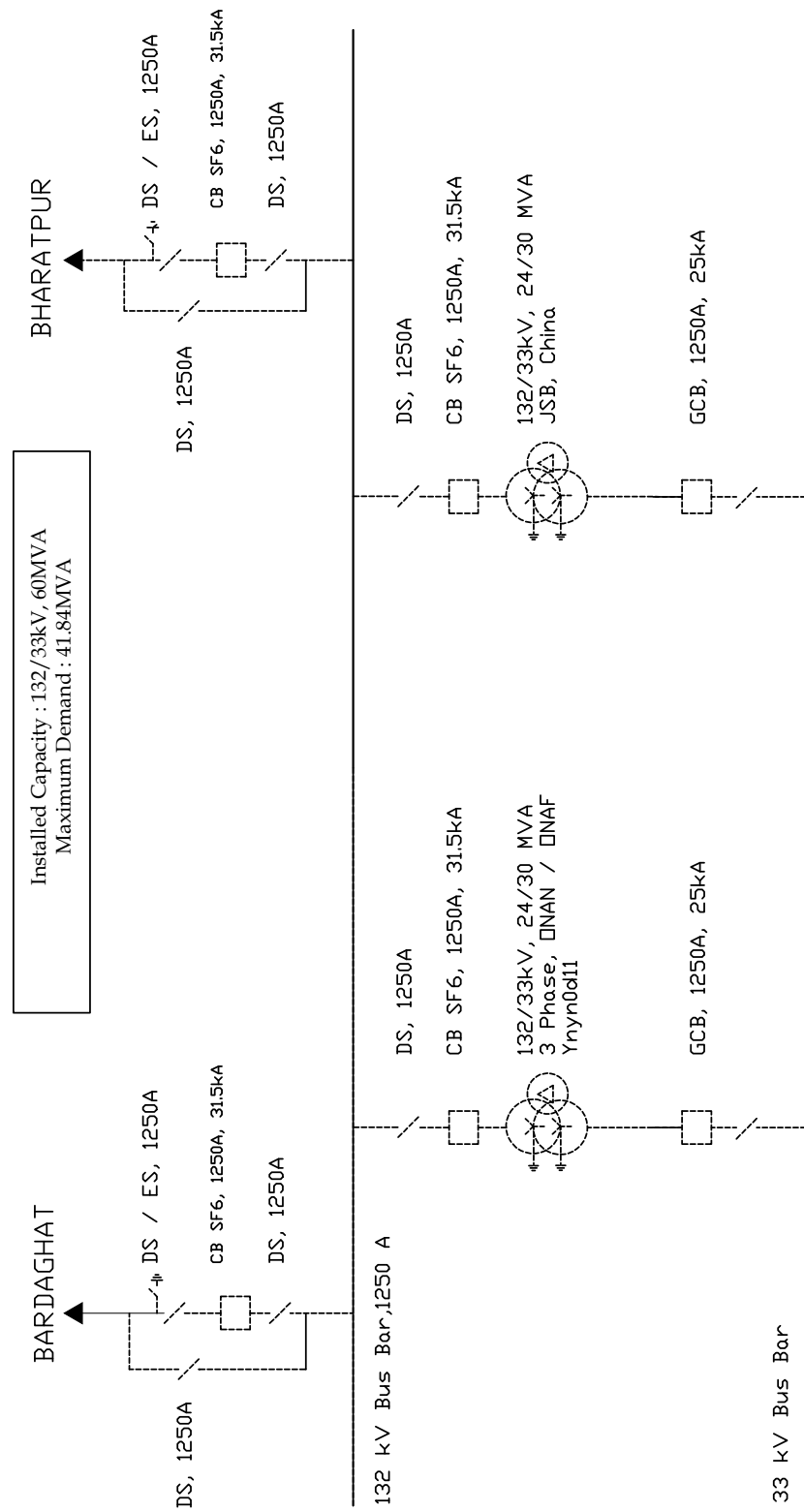
## 48. GHORAH SUBSTATION

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 facilitate smooth power flow and to supply increasing power demand of local area.



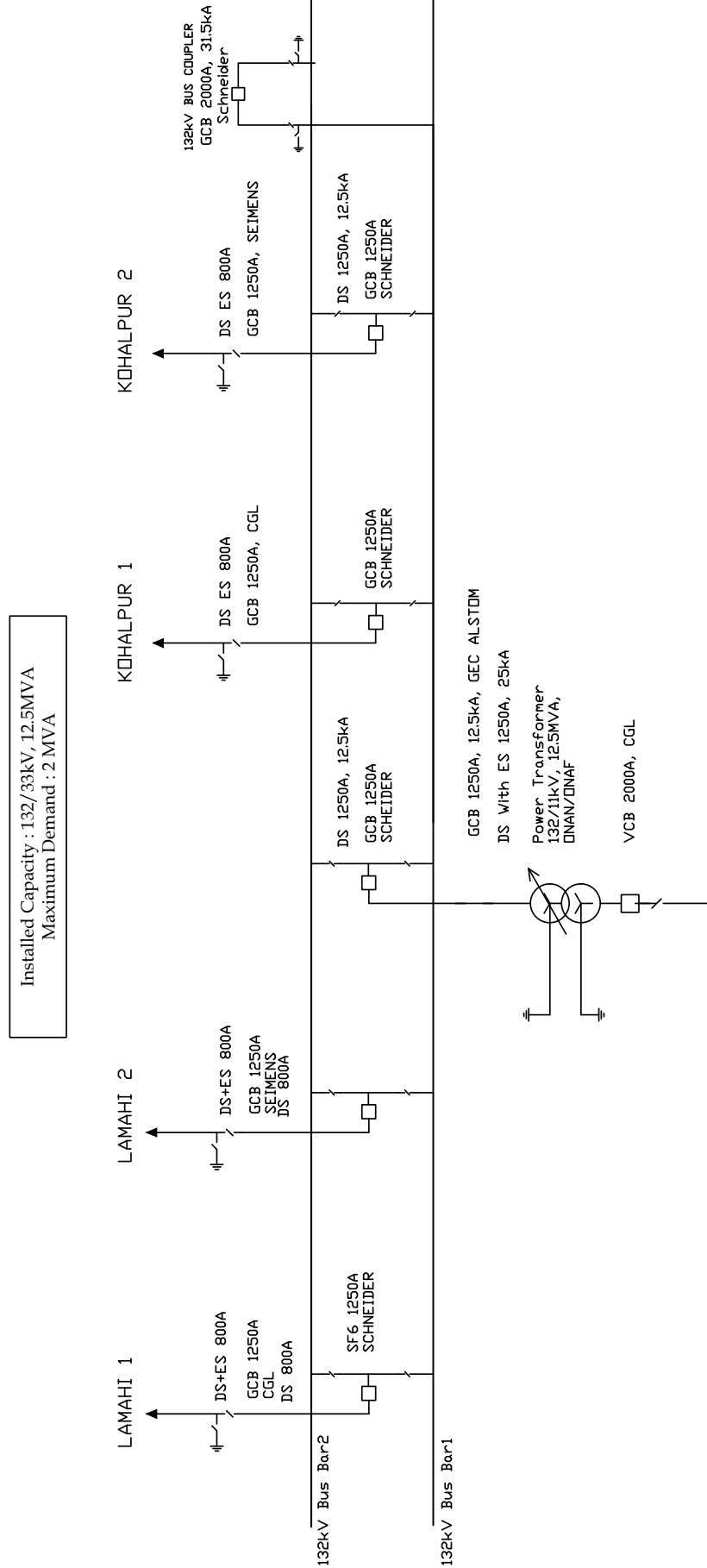
## 49. KAWASOTI SUBSTATION

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 Government. This Substation is interconnected with Bardaghat and Bharatpur S/S to facilitate smooth power flow and to supply increasing power demand of local area. The 33/11kV, 8MVA Transformer was upgraded to 16.6MVA in the year 2017. The substation was further upgraded to 2\*30MVA.



## 50. KUSUM SUBSTATION

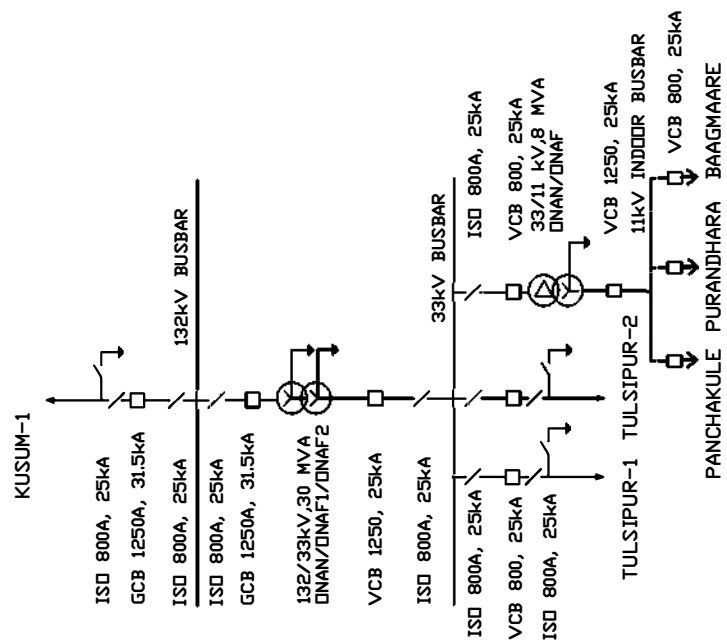
Kusum substation is located at Kusum of Banke District, Seti Zone. This Substation was Build Between the Existing Lamahi Kohalpur 132 KV Double circuit line. This Substation was commissioned in 2016 with 132/11kV, 30MVA capacity. The 30MVA Transformer was replaced by 12.5MVA in 2017.



## 51. 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-Metropolitan 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.

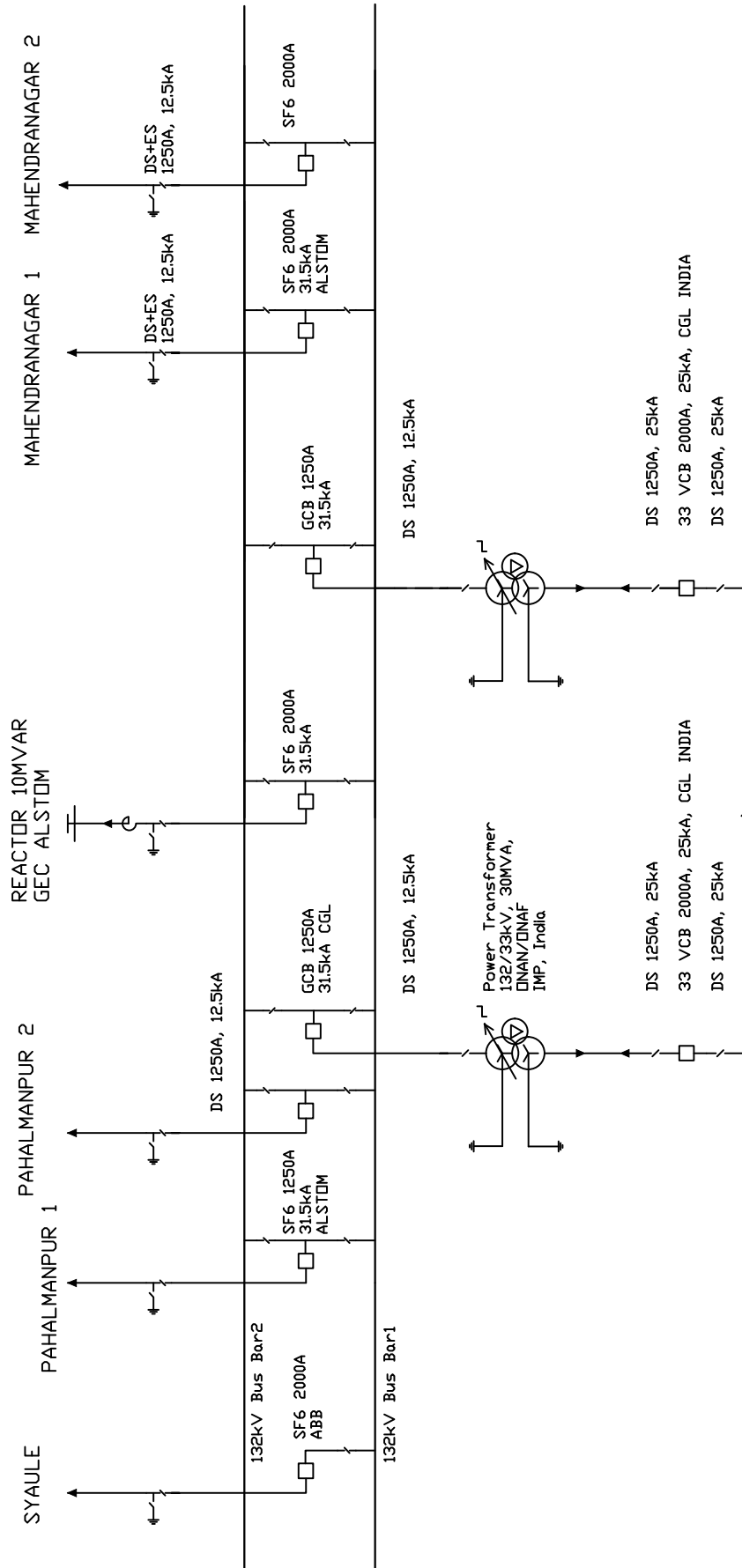
Installed Capacity : 132/33kV, 30MVA  
Maximum Demand : 19MVA



## 52. ATTARIA SUBSTATION

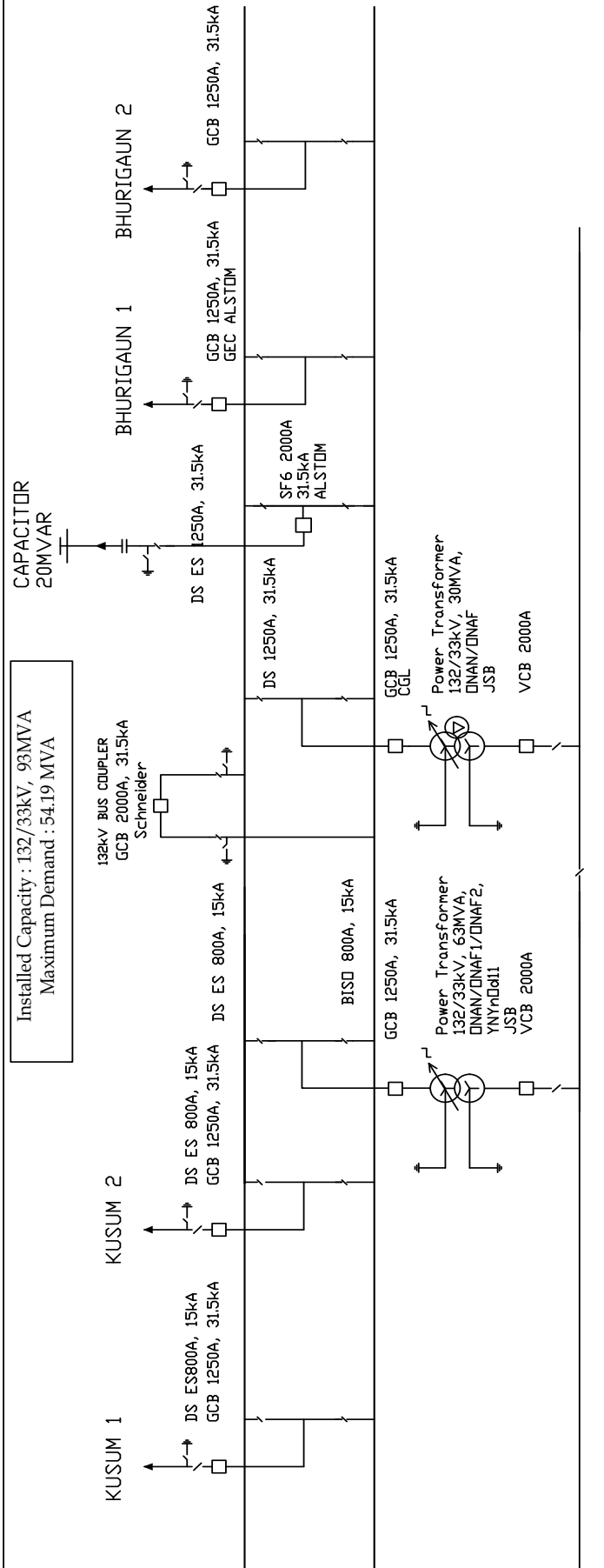
Attaria substation with single bus system, located at Attariya of Kailali district of Seti zone feeds power to Dhangadi, Dipayal, Attariya, Krishnapur, Chaumala and Geta. This substation is connected to Mahendranagar and Pahalmanpur substations by 132 kV double circuit line and Syaule Substation by 132kV 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 : 23.09MVA



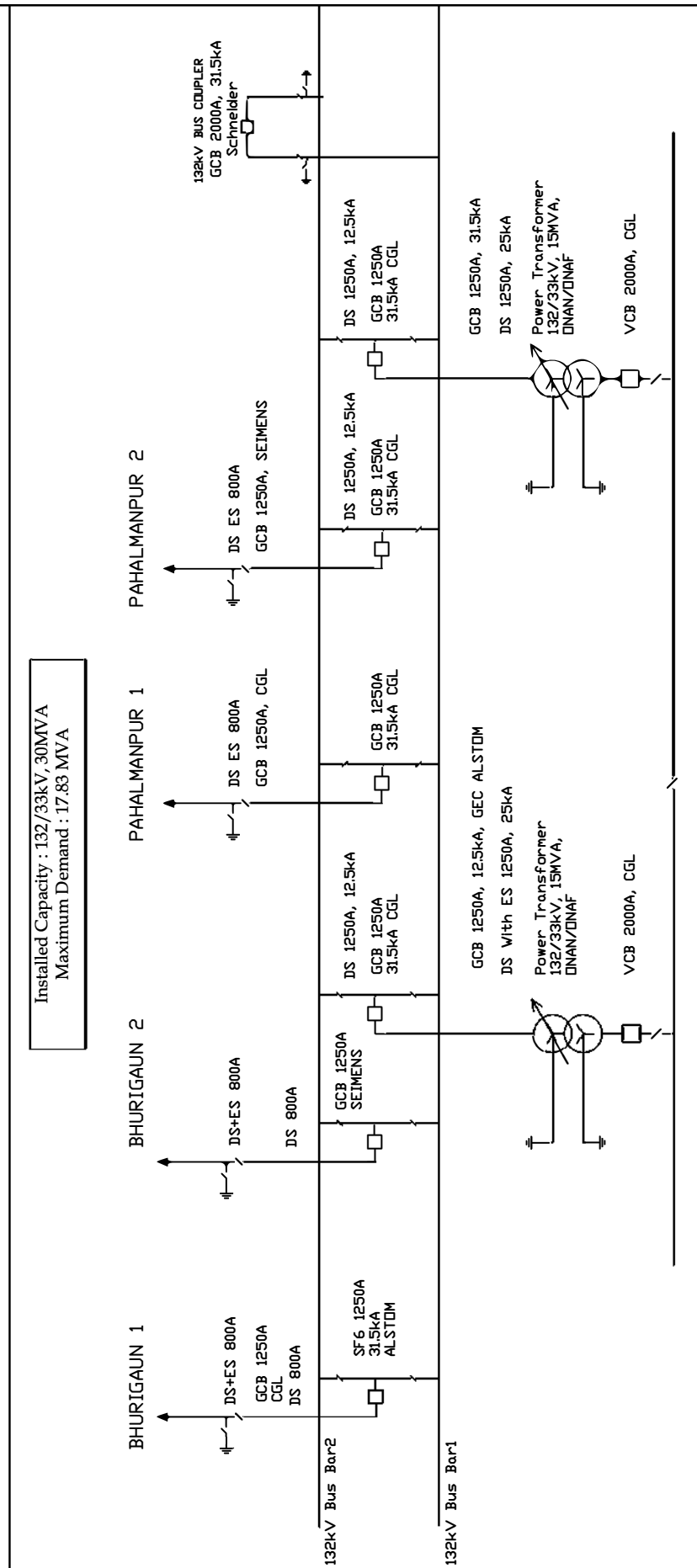
### 53. KOHALPUR SUBSTATION

Kohalpur substation with double bus system, located at Kohalpur of Banke District feeds power to Surkhet, Gulariya, Nepalgunj, Ranjha and Kohalpur. This substation is connected to Lamahi and Lamki substations 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.



## 54. LAMKI SUBSTATION

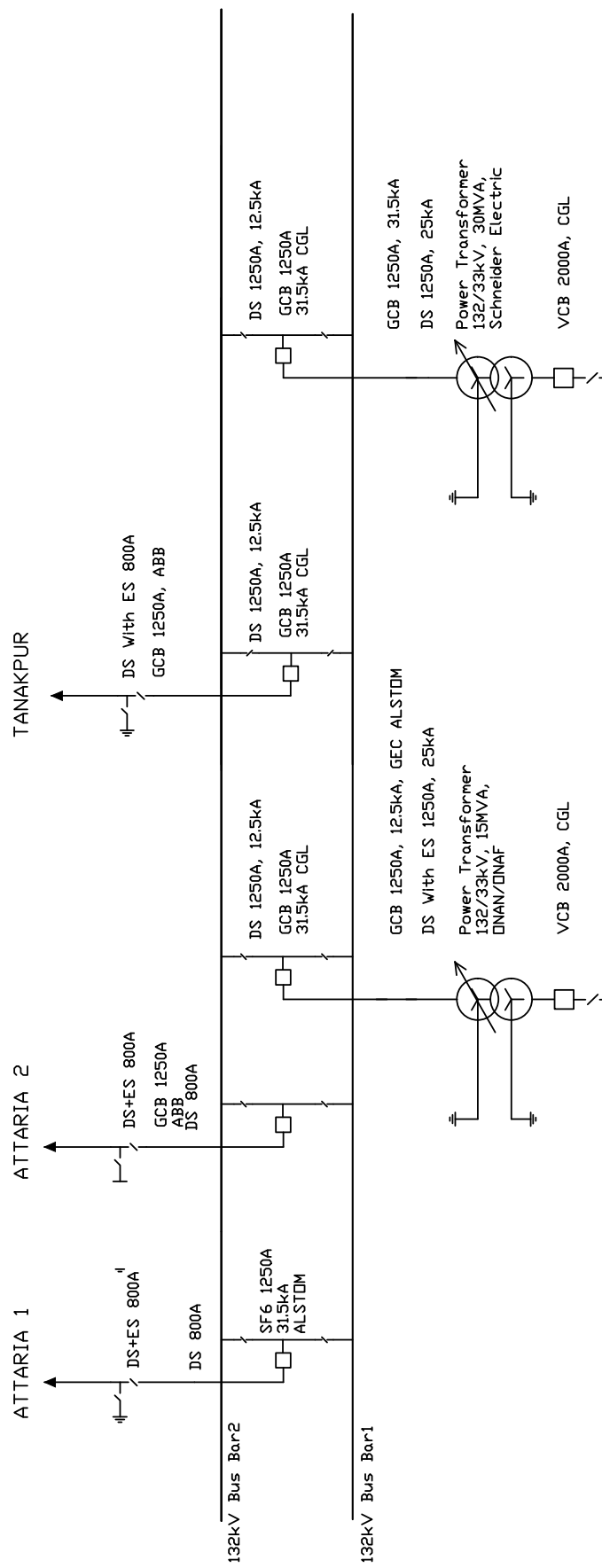
Lamki substation located at Lamki of Kailali District, Seti Zone, feeds power to Lamki, Tikapur, Chuha Lamki, Chisapani and Baliya. This Substation is connected to Bhurigaun and Pahalamnampur by 132 kV double circuit line. This Substation was commissioned in 1992 with the grant aid of French Government 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.



## 55. MAHENDRANAGAR SUBSTATION

Mahendranagar substation located at Lalpur of Kanchanpur district of Mahakali zone feeds power to Gaddachowki and Jhalari. This substation is connected to Tanakpur Powerhouse to import the power as per contract agreement between Indian and Nepalese Government, 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.

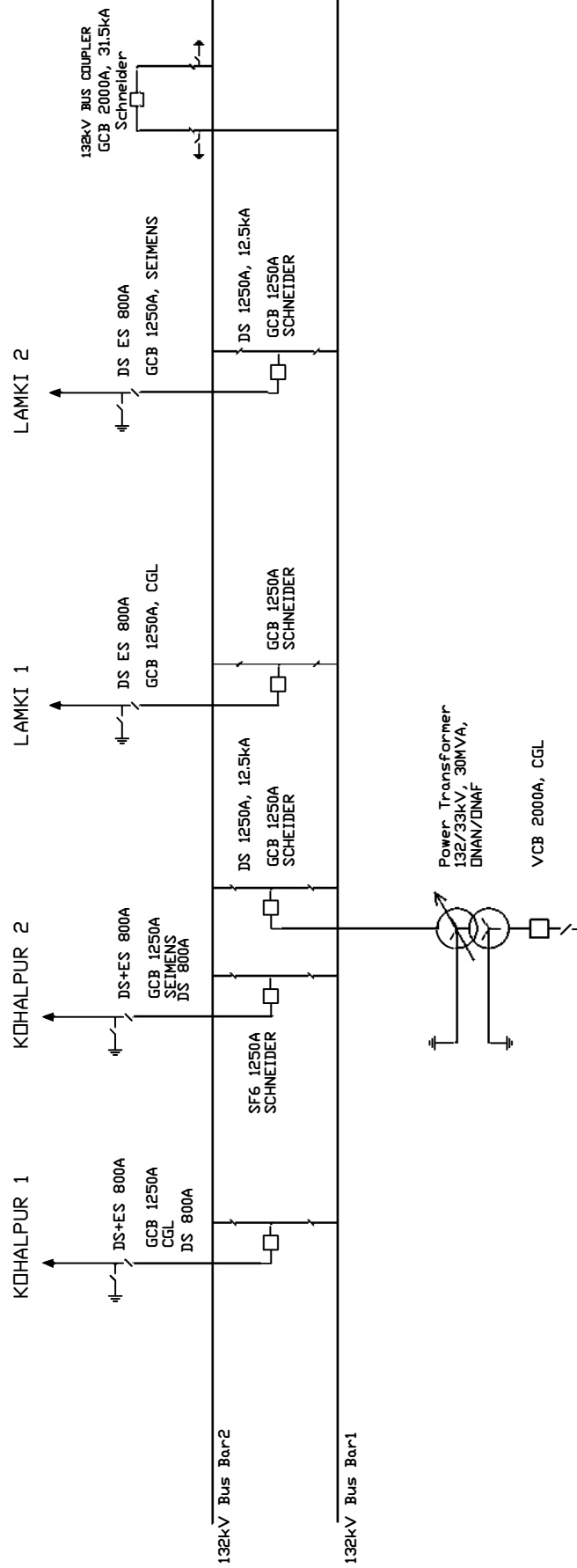
Installed Capacity : 132/33kV, 45MVA  
Maximum Demand : 23.29MVA



## 56. 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.

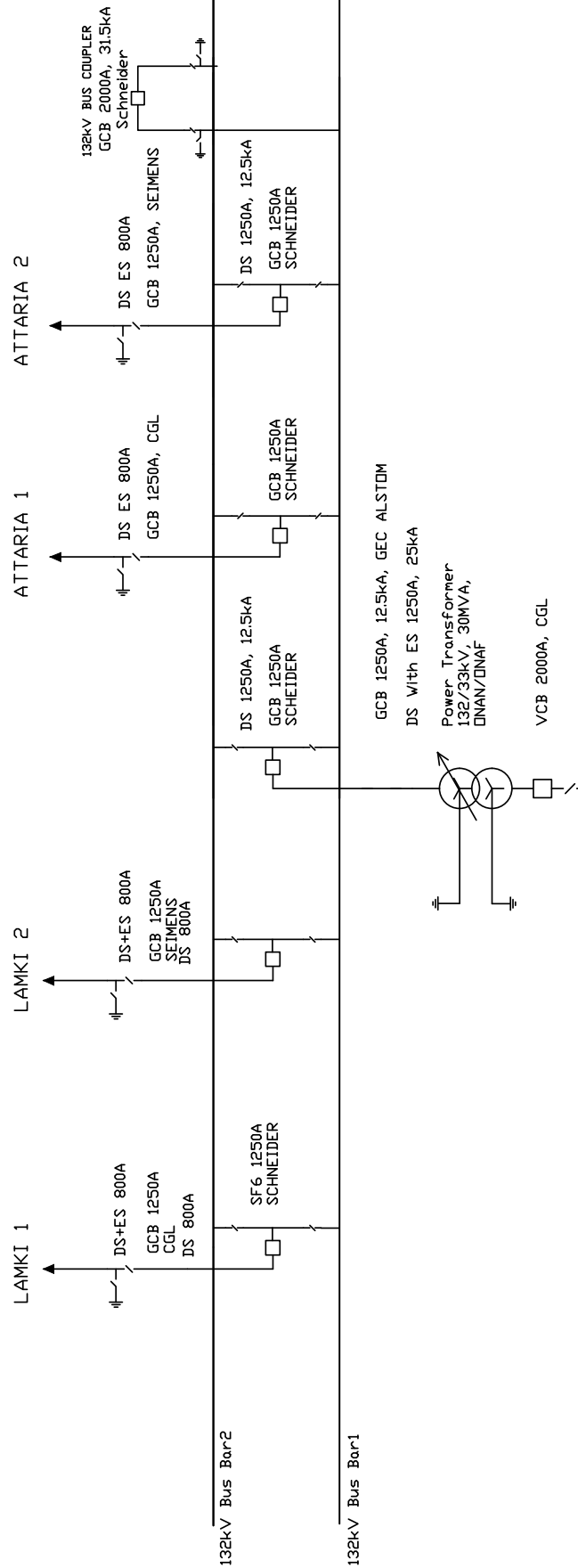
Installed Capacity : 132/33kV, 30MVA  
Maximum Demand : 2.11 MVA



### 57. 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.

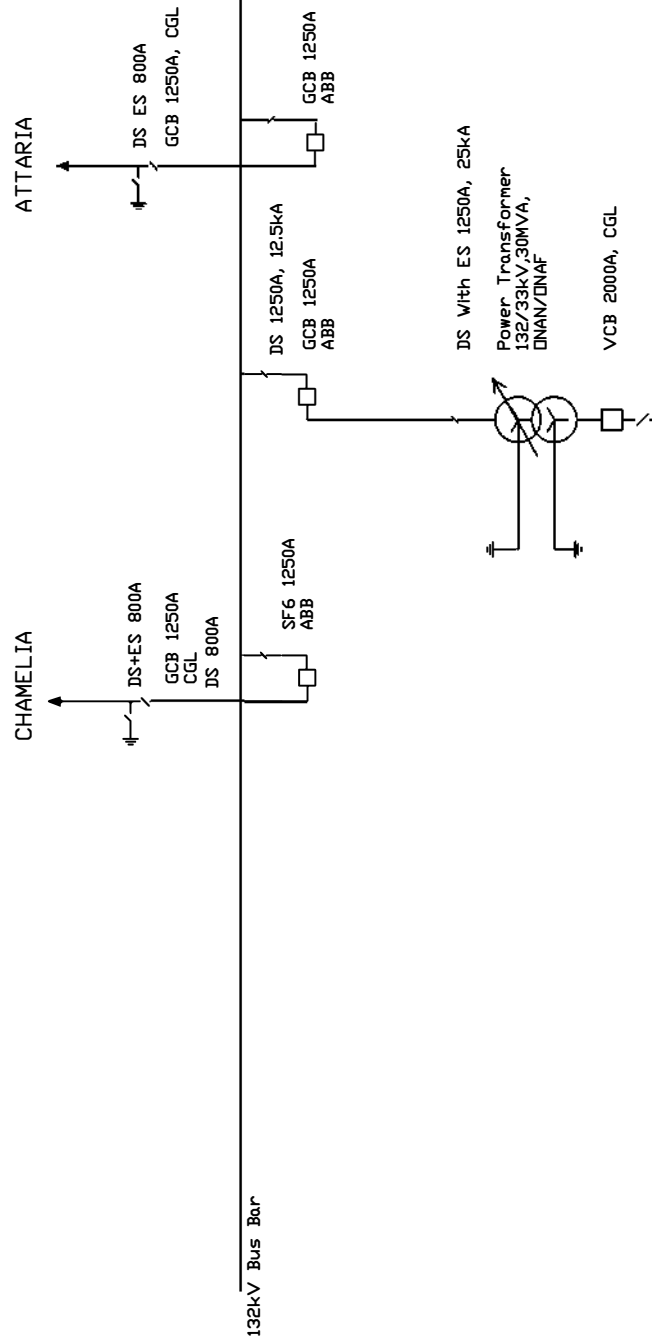
Installed Capacity : 132/33kV, 30MVA  
Maximum Demand : 6 MVA



## 58. SYAULE SUBSTATION

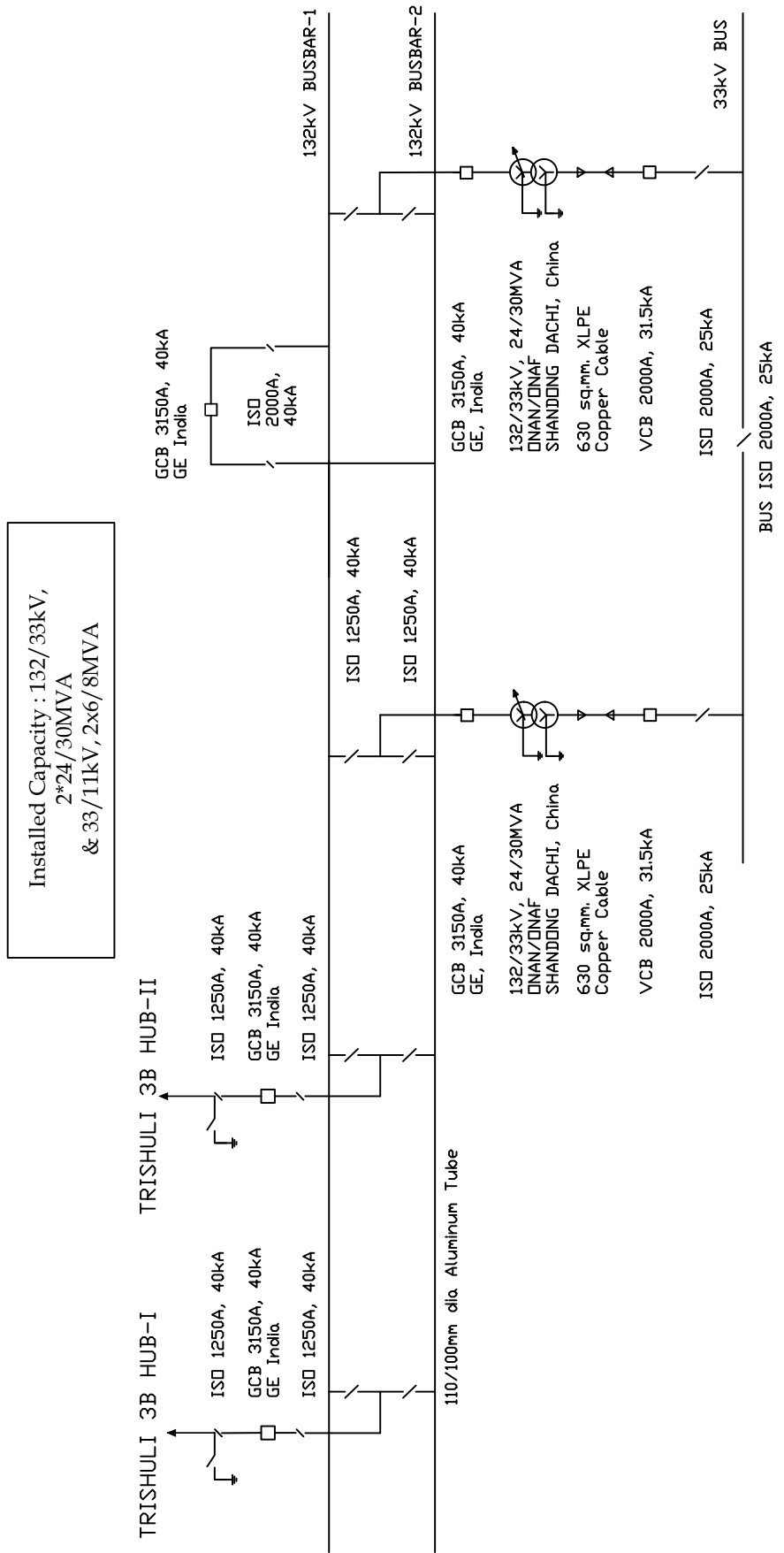
Syaule substation is located at Syaule of Dadeidhura District, Mahakali Zone, feeds power to Budar, Doti, Bagarkot, Dadeidhura, Bhatkanda, Doti Ghatal and Sakayal area. This Substation was built Between the Existing Chamelia Attaria 132 KV Single circuit line. This Substation was commissioned in 2018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

Installed Capacity : 132/33kV, 30MVA  
Maximum Demand : 8.46 MVA



## 59. SAMUNDRATAR 132/33/11 kV SUBSTATION

Samundratar Substation with Double Bus System located at Dupcheswor RM-6, Samundratar evacuates POWER from more than 10 hydropower projects located at Tadi river corridor and being developed by IPPS by 26km long 132kV double circuit transmission line to Trishuli 3B Hub Substation. 220/132kV Trishuli 3B Hub Substation is to be linked to Matatirha Substation (presently Matatirha-Upper Trishuli 220kV Transmission Line is charged at 132kV level. This substation also feeds power to eastern part of Nuwakot with 3 different 11kV feeders and 2 spare switchgears are provided for future connections.

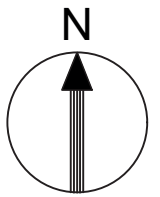




# POWER DEVELOPMENT MAP OF NEPAL

EXISTING / UNDER CONSTRUCTION TRANSMISSION LINES / SUBSTATIONS

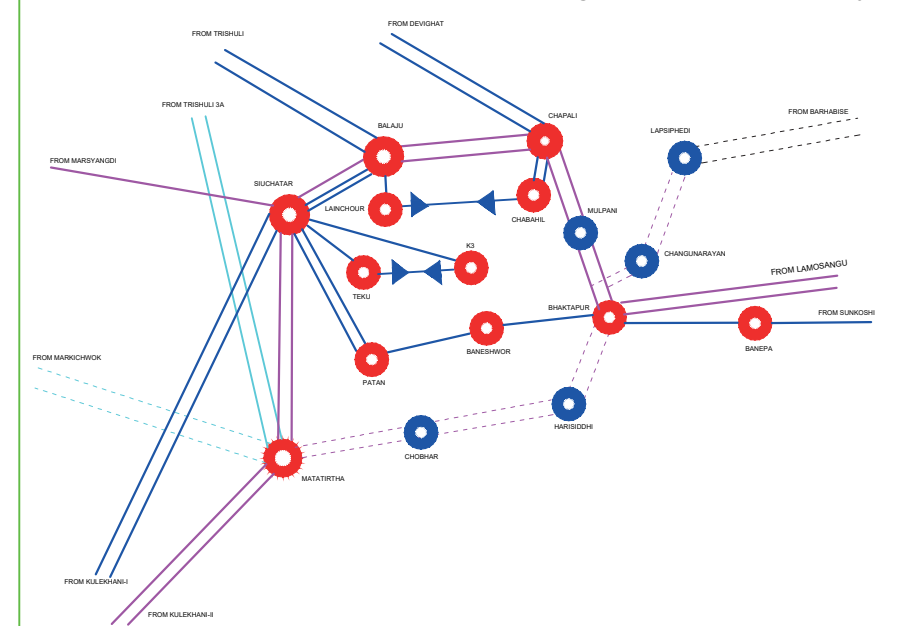
(NOT TO SCALE)



CHINA

INDIA

220,132 and 66 kV Network Feeding Kathmandu Valley



## LEGENDS

EXISTING UNDER-CONST. PLANNED

400 kV TRANSMISSION LINE  
220 kV TRANSMISSION LINE  
132 kV TRANSMISSION LINE  
66 kV TRANSMISSION LINE

GRID SUB-STATION

EXISTING UP TO ASAR 2079

POWER PLANTS

LOAD

Proposed For Reinforcement

NEPAL ELECTRICITY AUTHORITY  
TRANSMISSION DIRECTORATE  
GRID DEVELOPMENT DEPARTMENT  
(Revised Date: July 2021)

**Legend:**

Existing Under Construction Voltage Level

		400kV
		220kV
		132kV
		66kV
		33kV
		11kV

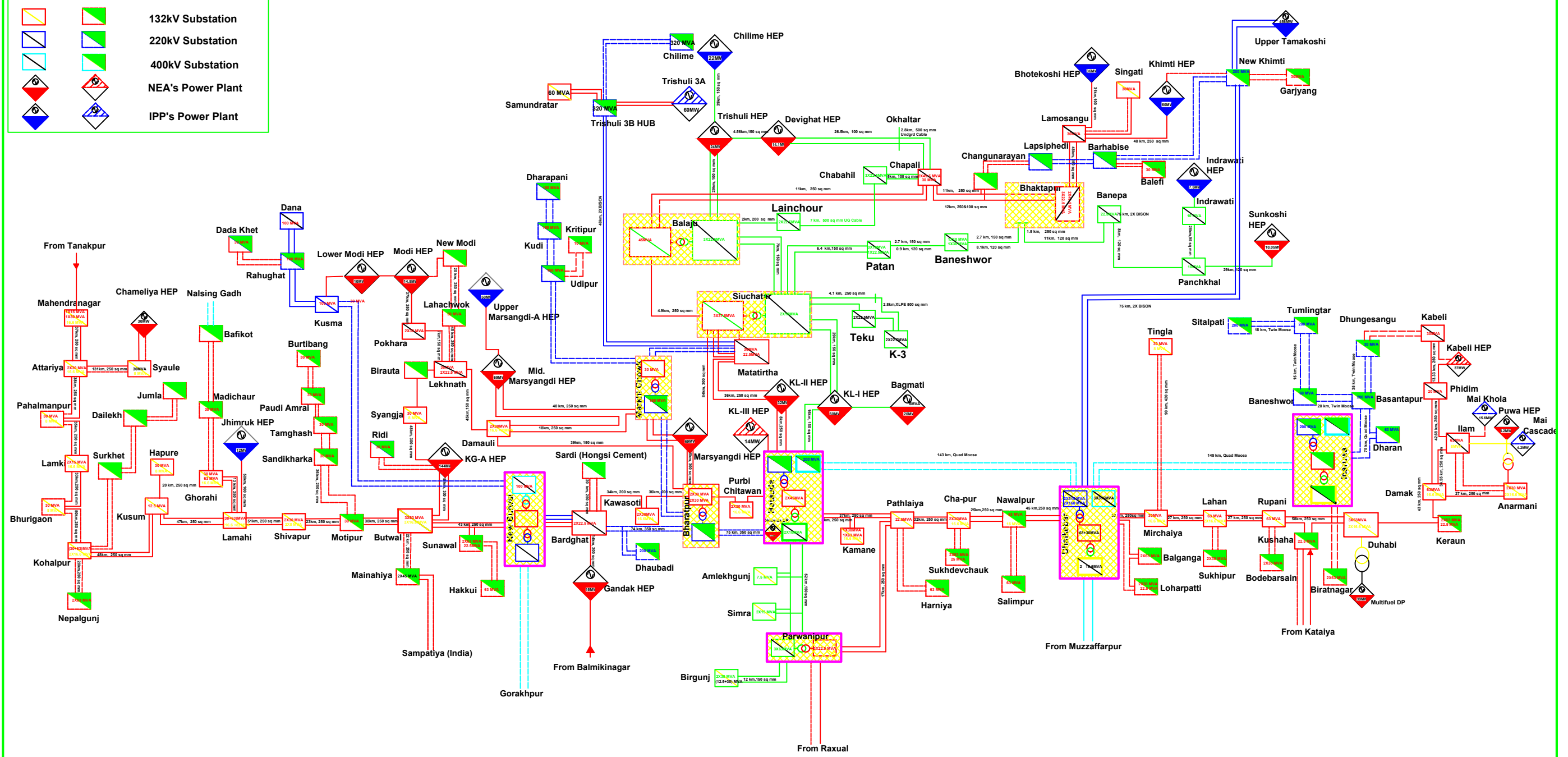
Length, Conductor Size

		132kV Substation
		220kV Substation
		400kV Substation
		NEA's Power Plant
		IPP's Power Plant

# INTEGRATED NEPAL POWER SYSTEM

(Existing & Under Construction Transmission Line Projects)

(Last Revision: July 2021)





Dana 220 kV Substation



220 kV Tower (Basantapur-Dhungesanghu Section)



Dhalkebar 400 kV GIS Substation



Samundratar 132 kV Substation

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Email: [transmission@nea.org.np](mailto:transmission@nea.org.np)  
Website: [www.nea.org.np](http://www.nea.org.np)